

FORESTS OF VALUABLE BROAD-LEAVED TREES ON NON-CARBONATE BEDROCK IN SLOVENIA (*DRYOPTERIDO AFFINI-ACERETUM PSEUDOPLATANI* ASS. NOVA HOC LOCO)

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Izvleček

Na silikatni matični podlagi na območju Pohorja in okolice Litije, v alpskem in predalpskem območju Slovenije, smo preučili gozdove plemenitih listavcev. Opisali smo novo asociacijo *Dryopterido affini-Aceretum* ass. nova hoc loco. Sestoji asociacije poraščajo strma koluvialna pobočja, vznožja pobočij, pogosto v ozkih dolinah nad vodotoki ter pobočja hudourniških jarkov. Na rastiščih te gozdne združbe prevladujejo koluvialna distrična rjava tla, pojavljajo se tudi ranker in nerazvita koluvialno-deluvialna distrična tla. Asociacijo ločujejo vrste, ki označujejo njen šibki acidofilni značaj. Asociacijo smo členili na dve geografski varianti: *D.-A.* var. geogr. *typica* (Litija) in *D.-A.* var. geogr. *Dentaria trifolia* (Pohorje). Ekološko pa smo asociacijo členili v tri subasociacije: *D.-A. scopolietosum carniolicae*, *D.-A. polystichetosum setiferi*, *D.-A. leucojetosum vernae*. V okviru subasociacij *D.-A. polystichetosum setiferi* in *D.-A. leucojetosum vernae* smo ločili tipično varianto in varianto z vrsto *Fraxinus excelsior*. V okviru subasociacije *D.-A. leucojetosum* smo izločili še varianto z vrsto *Saxifraga rotundifolia*. Asociacijo smo uvrstili v zvezo ilirskih gozdov plemenitih listavcev *Fraxino-Acerion* Fukarek 1969. Sestojte nove asociacije smo primerjali s sestoji drugih ilirskih javorjevih združb in sorodnih srednjeevropskih združb plemenitih listavcev.

Abstract

On the non-carbonate bedrock on the mountain range of Pohorje and in the vicinity of Litija, in the pre-Alpine and Alpine region of Slovenia, the forests of valuable broad-leaved trees were studied. A new association *Dryopterido affini-Aceretum* ass. nova hoc loco was described. The stands of this association thrive on steep colluvial slopes and their foothills, often in narrow valleys above streams and on slopes of torrential ditches. The colluvial dystric brown soil prevails on the sites of this forest community, but dystric leptosol and colluvial-delluvial dystric soil occur as well. The association is differentiated by the species which characterize its weak acidophilous character. It has been divided into two geographical races: *D.-A.* var. geogr. *typica* (Litija) and *D.-A.* var. geogr. *Dentaria trifolia* (Pohorje). Ecologically, it has been divided into three subassociations: *D.-A. scopolietosum carniolicae*, *D.-A. polystichetosum setiferi*, *D.-A. leucojetosum vernae*. Within the subassociation *D.-A. polystichetosum setiferi* and the subassociation *D.-A. leucojetosum vernae* we defined the typical variant and the variant with the species *Fraxinus excelsior*. Within the subassociation *D.-A. leucojetosum* we defined also the variant with the species *Saxifraga rotundifolia*. The new association was classified into the alliance *Fraxino-Acerion* Fukarek 1969. The stands of the new association have been compared with other Illyrian maple associations and related Central-European maple associations.

Ključne besede: *Dryopterido affini-Aceretum*, ilirska florna provinca, Slovenija, gozd plemenitih listavcev, sinsistematika, gozdna vegetacija, *Fraxino-Acerion*, nekarbonatna matična podlaga

Key words: *Dryopterido affini-Aceretum*, Illyrian floral province, Slovenia, forests of valuable broad-leaved trees, synsystematics, forest vegetation, *Fraxino-Acerion*, non-carbonate bedrock

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1. INTRODUCTION

In Central Europe, forests of valuable broad-leaved trees of the submontane and montane belt on non-carbonate bedrock are mostly classified into the association *Lunario-Aceretum* Grüneberg et Schlüter 1957 (Wallnöfer & al. 1993, Clot 1990), within the Central-European alliance of forests of valuable broad-leaved trees *Tilio-Acerion* Klika 1955. Müller (1992), however, classifies the forests of valuable broad-leaved trees on silicate slopes within the alliance *Tilio-Acerion* into an independent suballiance *Deschampsia flexuosae-Acerenion* Müller 1992, and treats the maple stands on silicate as the community *Deschampsia flexuosa-Acer pseudoplatanus* Klauk 1987.

Forests of valuable broad-leaved trees on non-carbonate bedrock in Slovenia and other parts of the Illyrian floral province have not yet been studied in detail. Since in Slovenia and other parts of the Illyrian floral province carbonate bedrock prevails, so far forests of valuable broad-leaved trees in this area have been described above all on carbonate bedrock. In Slovenia there is only one silicate mountain range-Pohorje. On the Pohorje mountain range on non-carbonate bedrock, these forests were first mentioned by M. Wraber, first as the association *Acereto-Ulmetum* (Wraber 1953), and later as the association *Sorbo aucupariae-Aceretum* (Wraber 1960), but his findings were published without the relevé material. Based on his descriptions of the association *Sorbo aucupariae-Aceretum* thriving in the altimontane belt, Clot (1990) in his synoptic survey of European maple stands classified the community into the Central-European association of forests of valuable broad-leaved trees of the altimontane and subalpine belt *Ulmo-Aceretum*. In the pre-Alpine-Alpine region of the Illyrian floral province the forests of valuable broad-leaved trees on non-carbonate bedrock are mentioned also by Marinček (1994), who proposed the name *Dryopterido tavelli-Fraxinetum*. In his work on the vegetation of the Šumik virgin forest (Marinček 1995b) he described the forests of valuable broad-leaved trees with two relevés and provisionally named them the community *Acer pseudoplatanus-Ulmus glabra*.

Most communities of valuable broad-leaved trees described in the territory of Slovenia and the wider region of the Illyrian floral province are classified into the Illyrian alliance of forests of valuable broad-leaved trees *Fraxino-Acerion* Fukarek 1969 (P. Košir 2004). On account of its neutrophilous-basophilous character, Illyrian vegetation is bound

above all on carbonate bedrock. This raises the question of whether the communities of valuable broad-leaved trees on non-carbonate bedrock in the region of the Illyrian floral province, where fewer Illyrian species are expected, are classified into the Central-European alliance of forests of valuable broad-leaved trees *Tilio-Acerion* or rather into the Illyrian alliance *Fraxino-Acerion*.

In this study we shall describe and present with an analytic table a new maple association *Dryopterido affini-Aceretum* ass. nova hoc loco, which occurs in the region of the Illyrian floral province on non-carbonate bedrock. By means of a comparative table of Illyrian maple and Central-European maple forest stands we shall define also their synsystematic classification.

2. METHODS

The relevés were made by applying the standard Central-European method (Braun-Blanquet 1964).

Vegetation relevés were made in late spring (May, June), when the vegetation is in its optimal phase and the species of both spring and summer aspect appear. Some of the plots were visited several times, so that the early spring aspect, as well as the summer aspect, were recorded. The species which were not developed at the time of the relevé were noted with +. The size of the sample plots was 200 to 400 m².

The collected vegetation relevés were organised together with the already published relevé material from the territory of the Illyrian floral province, partly also from Central Europe, in the TURBOVEG database (Hennekens in Schaminée 2001). To process and analyse the phytosociological relevés and their syntaxonomic classification we used the principal coordinate analysis ordination method (PCoA) from the computer package SYNTAX 2000 (Podani 2001). The dissimilarity coefficient was the similarity ratio.

When processing the vegetation relevés we used also the JUICE 6.1.10 (Tichý 2001) computer program to arrange the large phytosociological tables. When determining the diagnostic species we applied the measure of fidelity, which has become a frequently used method (Chytrý & al. 2002). The coefficient Φ was used in the JUICE (Tichý 2001) program as it allows for a comparison of species fidelity in datasets of different size. The species with the highest fidelity values were treated as diagnostic.

In the table, the plant species were arranged according to the syntaxonomical groups, following the Central-European (Oberdorfer 1994, Clot 1990, Wallnöfer & al. 1993) and southeast-European authors (Horvat & al. 1974, Zupančič 1999, Marinček & al. 1993, Marinček & Čarni 2000). Mosses are mentioned separately.

The description of the association includes the chorological spectrum. The classification of species (with exception of mosses, which were not considered here) into a certain chorological group follows Poldini (1991) and partly Pignatti (1982).

Species which occur only once in the table and with a small cover value were excluded from the table and are mentioned in Appendix.

The names of vascular plants follow the *Liste der Gefäßpflanzen Mitteleuropas* (Ehrendorfer 1973). When discussing the genera *Stellaria* and *Helleborus* we considered the new proposals from the *Mala flora Slovenije-Ključ za določanje praprotnic in semenk* (Martinčič & al. 1999). When looking for the names of ferns we followed the *Illustrierte flora von Mitteleuropa-Pteridophyta* (Kramer 1984), especially for the names of hybrids which are missing from the other lists of plants. For the names of mosses we used the *Seznam listnatih mahov (Bryopsida) Slovenije* (Martinčič 2003).

The newly described syntaxa were named according to the *Code of phytosociological nomenclature* (Weber & al. 2000). The Code does not treat the syntaxa of the ranks such as geographical race, variant and subvariant, which means that there are no current rules for their denomination.

The association was subdivided into lower taxonomical units applying the principle of multi-dimensional division of vegetation units (W. & A. Matuszkiewicz 1981). The results of the horizontal division (geographical axis) of vegetation units are geographically-macro-climatically conditioned subunits of the association (geographical races, geographical subraces). The vertical division into altitudinal forms is illustrated with the altitudinal axis. The expression of the site diversity in a smaller area, shown on the so called site axis, are the ecological (edaphically-microclimatically) conditioned subunits (subassociations, variants, subvariants). According to Matuszkiewicz (1981: 132), the three systematic categories mentioned are independent. Widely distributed associations are first divided into regional and vertical units, and then into subassociations. This means that a certain site subunit (subassociation) can occur in several or even all geographical subunits. On the other hand, howev-

er, there are also subassociations which are bound to a certain geographical subunit.

The soil conditions were studied with the representative soil profiles.

The soil profiles were described by Tomaž Prus, M. Sc., and the chemical analyses were conducted in the laboratories of the Pedology and Environment Protection Centre of the Biotechnical Faculty in Ljubljana.

The methods and conceptions used in the descriptions of the soil profiles follow Zupan & al. (1998).

3. RESULTS AND DISCUSSION

3a. Ecological circumstances and the study area

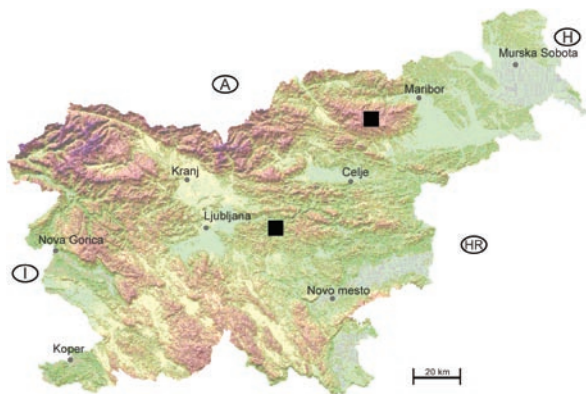


Figure 1: Study areas of the association *Dryopterido affini-Aceretum* in Slovenia

Slika 1: Območja raziskovanja asociacije *Dryopterido affini-Aceretum* v Sloveniji

In Slovenia, the stands of this association were found in the pre-Alpine and Alpine region, in the vicinity of Litija and on the non-carbonate Pohorje massif (Fig. 1), where they grow on steep colluvial slopes and their foothills, the slopes of narrow valleys (gorges and ravines), often above streams, and on slopes of torrential ditches. The contact community of the stands of valuable broad-leaved trees in the vicinity of Litija is *Blechno-Fagetum* I. Horvat ex Marinček 1970, but on Pohorje the stands of valuable broad-leaved trees occur in the wider distribution area of the zonal forest community *Cardamino savensi-Fagetum* Ž. Košir 1962 var. *Abies alba* Ž. Košir 1979 (var. *silicicolum*). On cold aspects on non-carbonate bedrock this community can grow

as low as at 400 m a. s. l. The community on Pohorje is in contact also with the stands of the association *Galio rotundifolii-Abietetum* M. Wraber (1955) 1959, which covers large surfaces on the Pohorje mountain range.

The larger part of Slovenia, as well as the study area of Litija and its vicinity, is part of the Illyrian floral province (Zupančič & al. 1987, Marinček 1994). Regarding Pohorje area, there are different opinions. Zupančič & al. (1987) exclude it from the Illyrian floral province and classify it within the Euro-Siberian-North-American region into the Central-European province, whereas Marinček (1994), despite the silicate bedrock, includes Pohorje into the region of the Illyrian floral province.

The association *Dryopterido affini-Aceretum* most often overgrows the northeastern and eastern aspects; more rarely, in narrow ravines, it occurs also on warmer aspects (SW, S to NW). It grows at altitudes between 300 and 800 m (more rarely also higher, between 900 and 1200 m). It is mostly found on steep slopes (from 30° to 45°, and even 60°), rarely on moderately steep slopes (5° to 25°).

The range of surface stoniness is 0 to 40 % (even 60 and 80 %), but in the largest part there is either no stoniness or it is insignificant (up to 20 %). There is mostly non-calcareous rubble, and in the stands along the torrential ditches also larger rocks or rock blocks.

Geological bedrock of the Pohorje mountains consists mostly of tonalites (the top and the eastern part of Pohorje). The main ingredient of the Pohorje tonalites are plagioclases. Their basicity is high (33 %), which is why the Pohorje tonalites are classified on the border between the acidic and neutral, and among neutral silicates (Ž. Košir 1979). On the margins of this tonalite mass the tonalites are followed by gneiss, mica schist, amphibolite, eclogite, serpentinite, chlorite-amphibolite slate and marble. Andesite and dacite, as well as flint-sericitic filit and filitoid slates with diabase are present in the lower parts of the western Pohorje (Slovenia-Geološka karta 1 : 500 000, 1993). In the region of Litija, however, the geological bedrock consists of Permian-carboniferous slaty claystones and flint sandstones (Slovenia-Geološka karta 1 : 500 000, 1993).

Colluvial dystric brown soil prevails on the sites of this forest community, but also dystric Leptosol and colluvial-delluvial dystric soil occur (Fig. 5). The soil profiles made in the stands of this association (Table 1, 2, 3 and 4) show that in general the

soil has relatively high values of cation exchange capacity (T), but compared to the soil on carbonate bedrock they have a lower content of base-forming cations in the soil (S), which results in a lower V value (portion of base-forming cations). C/N proportions are less favourable, which is the result of the lower pH values. The soil under the stands of valuable broad-leaved trees is colluvial. It is frequently refreshed on account of regular deposits of material and water, which contributes to a relatively fast mineralization (despite the lower pH values) and a continuous biological circulation of material.

Litija is situated in the region of the moderately continental climate of central Slovenia. Characteristic for it is a mean annual temperature of the coldest month (January) between 0 and -3°C, and a mean annual temperature of the warmest month (July) between 15 and 20°C. Another characteristic is the subcontinental rainfall regime with 1000 to 1300 mm yearly. The most rainfall comes down in summer, the least in winter. The Pohorje mountain range lies in northern Slovenia within the region of the climate of the lower montane world and the valleys between (Ogrin 1996). The common characteristic of the montane climate in Slovenia is that the mean temperatures of the coldest month are below -3°C and above 10 °C in the warmest month. The Pohorje rainfall regime is continental, which means that it gets between 1100 and 1700 mm of rainfall yearly.

3b. Structural and floristic composition

The upper tree layer covers between 60 and 90 % of the surface, the lower up to 60 %. Either *Fraxinus excelsior* or *Acer pseudoplatanus* prevail in the tree layer, but *Ulmus glabra* and *Picea abies* occur as well. *Carpinus betulus* is found in the stands of the association at lower altitudes, and *Fagus sylvatica* at higher altitudes. On the most humid sites in the stands two other species can be noticed – *Alnus incana* or *Alnus glutinosa*. *Abies alba*, however, occurs only within the geographical race *Dentaria trifolia* on Pohorje. *Corylus avellana*, and more rarely *Sambucus nigra*, are also common shrub species in the lower tree layer.

For the most part, the shrub layer is poorly developed and most often covers only 5 – 10 % of the surface, occasionally also up to 30 % or more (40, 60 %). The most common species are *Rubus fruticosus* agg., *Sambucus nigra* and *Corylus avellana*. The

most common among the tree species in the shrub layer are *Ulmus glabra*, *Acer pseudoplatanus*, *Picea abies* and *Fraxinus excelsior*.

The herb layer is well developed and covers between 80 and 100 % of the surface, except for the rockier sites, where these values are lower (60, 70 %). Well represented are the species of the alliance *Fraxino-Acerion*. *Stellaria montana*, *Adoxa moschatellina*, *Urtica dioica*, *Doronicum austriacum* and *Geranium robertianum* have the highest constancy and coverage. The species *Lunaria rediviva* appears with a lower constancy, but reaches high cover values in the stands. It is the same with the species *Scopolia carniolica*, *Lamium orvala* and *Polystichum setiferum*. Species of the order *Fagetalia sylvaticae* Pawł. in Pawł. et al. 1928 are the most common; among them, *Petasites albus* stands out with its constancy and coverage. Other species with high constancy and large coverage are also *Symphytum tuberosum*, *Lamiastrum flavidum*, *Mercurialis perennis* and *Asarum europaeum*. Other well represented species are those of the alliance *Alno-Ulmion* Br.-Bl. et Tx. 1943 and class *Vaccinio-Piceetea* Br.-Bl. in Br.-Bl. et al. 1939. Within the alliance *Alno-Ulmion* the species *Impatiens noli-tangere* and *Chrysosplenium alternifolium* stand out for their coverage and constancy, as do *Oxalis acetosella*, *Dryopteris affinis*, *Gentiana asclepiadea*, *Dryopteris dilatata*, *Luzula luzuloides* and *Phegopteris connectilis* among the species of the class *Vaccinio-Piceetea*. The last three species are also the differential species of the association. Other syntaxonomical groups are more poorly represented. Also to be mentioned here are the species *Anemone nemorosa* (*Quercus-Fagetea* Br.-Bl. et Vlieg. in Vlieg. 1937), *Athyrium filix-femina* and *Senecio fuchsii* (*Adenostyletalia* G. et J. Br.-Bl. 1931).

For the most part, the moss layer covers only a small surface (5–10 %) or none at all. Only rarely does it cover up to 20 or 30 % of the surface, exceptionally even more. Non-carbonate rocks are often bare or only slightly covered with mosses. The most common and with the highest cover values is *Plagiothecium undulatum*, followed by *Plagiothecium nemorale*, *Brachythecium rutabulum*, *Hypnum cupressiforme* and *Eurhynchium angustirete*. The most common among the differential species of the silicate communities (acidophilous species) are those of the order *Plagiothecium* (the already mentioned *P. nemorale* and *P. denticulatum*) and of the orders *Polytrichum* (*P. formosum* and *P. commune*), as well as the species *Atrichum undulatum*. Diversity of the species is substantial – we determined as many as 41 different moss species.

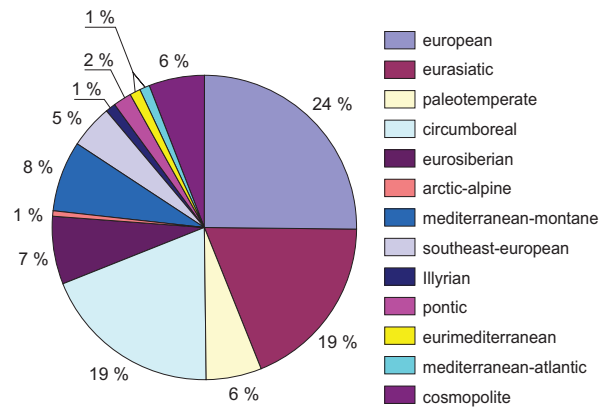


Figure 2: Syntaxonomical spectrum of the association *Dryopterido affini-Aceretum*

Slika 2: Sintaksonomski spekter asociacije *Dryopterido affini-Aceretum*

Figure 2 presents the species composition of the community in view of the syntaxonomical classification with the syntaxa. On account of their substantial diversity, mosses represent the highest proportion (18 %) in the picture, although the moss layer is generally poorly developed. The highest proportion (18 %) goes also to the species of the order *Fagetalia sylvaticae*, which is in accordance with the synsystematic classification of the stands. They are followed by the species of the alliance *Fraxino-Acerion* (13 %) and *Alno-Ulmion* (11 %). A relatively high proportion of the species of the alliance *Alno-Ulmion* indicates the hygrophilous character of the association; the sites of these communities are extremely well saturated because of the bedrock with low capacity for water permeation. Water often trickles along the slopes, and the stands thrive on the slopes along mountain streams. A relatively high proportion goes also to the species of the class *Vaccinio-Piceetea* (10 %), which indicates a moderately acidophilous character of the community of valuable broad-leaved trees on non-carbonate bedrock. Other groups are not as well represented.

The composition of floral elements is presented in **Figure 3**. The European floral element prevails in this association (24 %) and is followed by the same proportion of circumboreal and Eurasian (19 %) floral element. The studied association is differentiated from other Central-European communities by the Mediterranean-montane (8 %), southeast-European (5 %) and Illyrian (1 %) floral element. Other floral elements are not so representative.

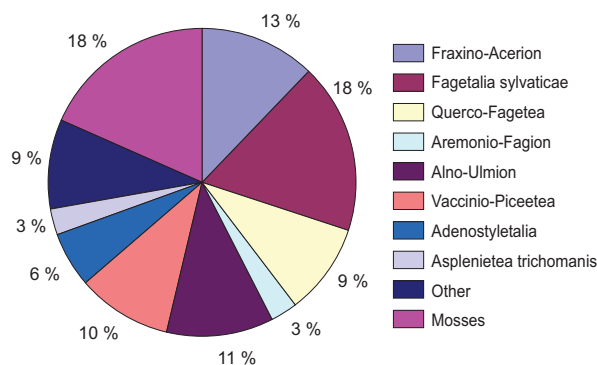


Figure 3: Geoelemental spectrum of the association *Dryopterido affini-Aceretum*

Slika 3: Geoelementni spekter asociacije *Dryopterido affini-Aceretum*

The holotype of the association *Dryopterido affini-Aceretum* is relevé No. 26 in Table 5 hoc loco.

3c. Diagnostic species

As the associations of forests of valuable broad-leaved trees are often without character species or even without specific differential species, Clot (1990) establishes the associations of the Central-European maple forests on the basis of a combination of ecological groups of species. Wallnöfer & al. (1993) also described the associations of Central-European alliance of valuable broad-leaved trees *Tilio-Acerion* in Austria based on such a diagnostic combination of species where a group of character species is often missing. This article, too, determines a new association which is floristically sufficiently different from the related maple communities above all on the basis of differential species.

The differential species of the association *Dryopterido affini-Aceretum* are: *Dryopteris affinis*, *Luzula luzuloides*, *Dryopteris dilatata*, *Phegopteris connectilis* and *Gymnocarpium dryopteris*. All of the species are classified into the class *Vaccinio-Piceetea*. The listed species reach their optimal growth on non-carbonate rocks and thus indicate the moderately acidophilous character of the association.

The association was named after the species *Dryopteris affinis*, which is the most common among the species listed above and reaches the highest cover values. It thrives on humid soil rich in nutrients and poor in limestone, on sites with high air humidity (Kramer 1984). It is found in humid and shady montane beech and fir forests, mostly on

sites of silicate bedrock (Oberdorfer 1994). Poldini (1991) discusses it within the group of the European floral element. Ž. Košir (1994) studied thoroughly the species *Dryopteris affinis* in Slovenia in connection with the communities of *Abies alba* on silicate. He found that the species occurs with a high constancy and coverage on acidic sites, i.e. in the environment where the species *Dryopteris filix-mas* occurs with a substantially lower vitality. He also mentioned the hybrid *Dryopteris X tavelii* (a hybrid between *Dryopteris filix-mas* and *Dryopteris affinis*), which is supposed to be the most common species on deep, rather unstable silicate colluvial soil with an expressive hillside water influence and »aceretal« character. Marinček (1994), who provisionally named the forests of valuable broad-leaved trees on non-carbonate bedrock after this hybrid, is of a similar opinion. However, Kramer (1984) establishes that on sites with both parental species the hybrid occurs only individually and never forms entire populations. It does not reproduce by spores. *Dryopteris X tavelii* should therefore be treated as a hybrid and not as a species, so it was not specifically dealt with in our relevés. According to Kramer (1984), the publications which mention the whole populations of this hybrid confused it with the subspecies *Dryopteris affinis* subsp. *robusta*, which is very similar to the hybrid.

4d. Division of the association into lower syntaxonomical units

Within the association we distinguish two geographical races:

- *D.-A.* var. geogr. *typica* var. geogr. nova hoc loco (the vicinity of Litija) and
- *D.-A.* var. geogr. *Dentaria trifolia* var. geogr. nova hoc loco (Pohorje).

The differential species of *D.-A.* var. geogr. *Dentaria trifolia* are: *Dentaria trifolia*, *Hieracium transsylvanicum* and *Abies alba*. They characterize the thriving of these stands in the wider distribution area of the community *Cardamino savensi-Fagetum* var. *Abies alba*. The stands of the typical race were found in the pre-Alpine region of Slovenia. The race is characterized by the species *Scopolia carniolica*, which grows abundantly in these stands.

Ecologically, the association was subdivided into three subassociations:

- *D.-A. scopolietosum carniolicae* subass. nova hoc loco
- *D.-A. polystichetosum setiferi* subass. nova hoc loco
- *D.-A. leucojetosum vernaе* subass. nova hoc loco

Subassociation *D.-A. scopolietosim carniolicae* subass. nova hoc loco (Table 5/1–7) Stands of this subassociation grow on steep, very moist slopes and their foothills in narrow valleys with a small stream, in the submontane belt. The differential species of the subassociation are: *Scopolia carniolica*, *Blechnum spicant*, *Alnus glutinosa*, *Cardamine amara* and *Equisetum pratense*. *Blechnum spicant* indi-

cates that the contact community of the stands of this association is the community *Blechno-Fagetum*. Other species indicate very moist soil on the bedrock which has low capacity for water permeation. Also indicative of moist sites is *Carex brizoides*, which is very common in the stands. *Carpinus betulus*, which is indicative of the stands in the submontane belt, is relatively well represented mostly in the lower tree layer. The stands of this subassociation overgrow the most humid and the most acidic sites within the association, as is demonstrated also in the analysis of the soil profile. Dystric Cambisols prevail (Table 1).

Table 1: Soil profile description (profile 1)

Tabela 1: Opis pedološkega profila (profil 1)

Profile 1

Locality: Litija, ravine under Špik, relevé No. 7 (Table 5), the foot of the slope without surface rockiness and stoniness

Bedrock: Permcarbonian slate claystone and sandstone

Soil type: Dystric Cambisol

Profile description:

Ol: 4 (2) – 0 cm; maple, durmast oak, hornbeam and beech foliage

A: 0–14 cm; silty loam, subangular blocky structure, very humose; medium distinct peds – relatively unstable; consistence is loose and friable; dark brown in colour, 7,5 YR 3/2; moist and with a common abundance of fine and medium roots; 15 % of the skeleton consisting of sharp-edged particles up to 1 cm in size; wide C/N proportion – moder

BvC: 14 – 43 cm; angular blocky structure, of medium stability and medium distinct peds, clayey texture; consistence is friable to firm; medium humose on account of organic substance distributed in the passages of withered roots; the colour is yellowish brown, 10 YR 5/4; as wet as the upper horizon, with only individual roots; 30 % of the skeleton, sharp-edged, up to 5 cm in size; gradual transition into the next horizon

CBv: 43 – 85+ cm; of the same structure as the upper – angular blocky structure, medium distinct peds with medium stability, clayey texture; its consistency is crumbly; contains small amounts of humus on account of organic matter distributed in the passages of withered roots; the colour is yellowish brown, 10 YR 5/4; as wet as the upper two horizons, also with only individual roots; 60 % of skeleton, sharp-edged up to 10 cm in size; gradual transition into the next horizon

| HORIZON | depth | pH | P ₂ O ₅ AL | K ₂ O AL | org. matter | C | CN prop. | N toget. | sand | silt coarse | silt fine | silt toget. | clay | text. class |
|---------|----------|-------------------|-------------------------------------|------------------------|----------------|-----|-------------|-------------|------|----------------|--------------|----------------|------|----------------|
| | | CaCl ₂ | ---mg/100g--- | | % | % | | % | % | % | % | % | % | |
| A | 0-14 cm | 4.4 | 2.7 | 21.6 | 12.7 | 7.4 | 22.4 | 0.33 | | | | | | |
| BvC | 14-43 cm | 4.1 | 0.2 | 13.7 | 2.4 | 1.4 | 8.8 | 0.16 | 41.6 | 9.9 | 34.1 | 44.0 | 14.4 | L |
| CBv | 43-85 cm | 4.2 | | | 1.9 | 1.1 | 9.2 | 0.12 | 48.5 | 10.0 | 22.3 | 32.3 | 19.2 | L |

AMMONACETATE extraction

| HORIZON | depth | Ca | Mg | K | Na | H | S | T | V | Ca | Mg | K | Na | H | |
|---------|----------|-----------------------------------------------|------|------|------|-------|---------------|------|------|------|-----|-----|-----|------|--|
| | | ----- mmol C _e / 100g sample ----- | | | | | ----- % ----- | | | | | | | | |
| A | 0-14 cm | 3.09 | 0.89 | 0.55 | 0.01 | 20.85 | 4.5 | 25.4 | 17.7 | 12.2 | 3.5 | 2.2 | | 82.1 | |
| BvC | 14-43 cm | 0.52 | 0.25 | 0.32 | 0.01 | 17.45 | 1.1 | 18.6 | 5.9 | 2.8 | 1.3 | 1.7 | 0.1 | 93.8 | |
| CBv | 43-85 cm | 1.85 | 0.39 | 0.28 | 0.01 | 14.00 | 2.5 | 16.5 | 15.2 | 11.2 | 2.4 | 1.7 | 0.1 | 84.8 | |

NOTE: Moder of BvC as well as of CBv horizon contains a large amount of highly mouldering brown claystones, up to 5 mm in size. Larger pieces are sandstones.

The wide C/N proportion is somewhat surprising; it could be the consequence of the colder aspect. The soil is very acidic and very badly saturated with base-forming cations.

Holotype of the subassociation *Dryopterido affini-Aceretum scopolietosum carniolicae* is relevé No. 3 in Table 5 hoc loco.

Subassociation D.-A. polystichetosum setiferi sub-ass. nova hoc loco (Table 5/ 8–19, Fig. 6)

The stands of this subassociation grow on steep colluvial slopes and foothills, alluvial fans and concavities, in valleys with permanent running water of the submontane and partly also montane belt. In comparison with *D.-A. leucojetosum vernaе* the subassociation *D.-A. polystichetosum setiferi* thrives at lower altitudes, and compared to *D.-A. scopolietosum carniolicae*, which also thrives at lower altitudes, the stands of the studied subassociation occur on warmer sites. The differential species of the subassociation are: *Polystichum setiferum*, *Polystichum x bicknelli*, *Polystichum x wirtgenii*, *Aegopodium podagraria*, *Brachypodium sylvaticum* and *Glechoma hirsuta*. Es-

pecially characteristic is the abundant growth of the fern *Polystichum setiferi* and its hybrid *Polystichum x bicknelli* (= *P. aculeatum* x *P. setiferum*). The differential species indicate the growth of the stands at lower altitudes and on warmer sites that are well supplied with water. Also indicative of the wet soil are the species *Carex brizoides* and *Festuca gigantea*, which are well represented in the stands. Another indicator which proves that the stands thrive above all in the submontane belt is the presence of the species *Carpinus betulus*. Sporadic occurrence of the species *Castanea sativa* in the stands of this subassociation indicates that the stands on warmer aspects are in contact with the community *Castaneo sativae-Fagetum* (M. Wraber 1955) Marinček et Zupančič 1995.

Various soil types occur, among them Dystric Leptosol (Table 2) and colluvial-delluvial dystric soil (Hyperskeletal Dystric Leptosol, Table 3).

Table 2: Soil profile description (profile 2)

Tabela 2: Opis pedološkega profila (profil 3)

Profile 2

Locality: Pohorje, Ruše in the direction of Lobjanica, relevé No. 11 (Table 5), stream valley, numerous lateral springs, steep and landslide slopes

Bedrock: Slate

Soil type: DYSTRIC LEPTOSOL

Profile description:

Ol: mosaically scattered, in places bare surface; beech, chestnut, hornbeam, maple and ash tree foliage, spruce needles

A: 0-15(20) cm; silty loam of subangular blocky structure, humose; medium distinct peds with medium stability; consistency is loose and friable; the colour is black 10YR 2,5/1; fresh, abundant roots; singular skeleton, sharp-edged and platy, up to 4 cm in size; C/N proportion is characteristic for moder mull. Sharp transition into C.

C: 15(20)+ cm

| HORIZON | depth | pH CaCl ₂ | P ₂ O ₅ AL ---mg/100g--- | K ₂ O AL | org. matter % | C % | CN prop. | N toget. % | | | | | | |
|---------------------|---------|-------------------------------------------|------------------------------------------------------|------------------------|---------------------|--------|-------------|------------------|------|------|-----|-----|----|------|
| A | 0-15 cm | 4.9 | 6.5 | 6.5 | 6.2 | 3.6 | 18.0 | 0.20 | | | | | | |
| AMMONIUM extraction | | | | | | | | | | | | | | |
| HORIZON | depth | Ca | Mg | K | Na | H | S | T | V | Ca | Mg | K | Na | H |
| | | mmol C _e / 100g sample ----- % | | | | | | | | | | | | |
| A | 0-15 cm | 6.91 | 1.37 | 0.13 | 0.01 | 13.30 | 8.4 | 21.7 | 38.7 | 31.8 | 6.3 | 0.6 | | 61.3 |

NOTE: Colluviation is visible in the surface shifting (and depositing) of stone gravel mixed with organic matter in practically the entire soil profile. For this reason even Bv horizon comprises relatively large amounts of organic matter. Shifting processes resulting from leaching are less important due to the considerable incline, but are probably also present.

Table 3: Soil profile description (profile 3)
Tabela 3: Opis pedološkega profila (profil 3)

Profile 3

Locality: Pohorje, the Lobnica valley, relevé No. 18 (Table 5), the bottom slope or the foothills of a smaller valley, non-rocky

Bedrock: slate

Soil type: HYPERSKELETIC DYSTRIC LEPTOSOL

Profile description:

Ol: mosaically scattered, in places bare surface; beech, ash, rarely also maple foliage

(A): 0–11 cm; subangular to angular blocky sandy loam, humose; medium distinct peds – unstable; consistence is friable and fine; the colour is dark reddish brown, 5YR 4/2; fresh, roots abundance is common; 40 % of skeleton, sharp-edged up to 5 cm in size; C/N proportion is still characteristic for mull.

I: 11–32 cm; sandy loam of fine angular blocky structure, with small amounts of humus; medium distinct peds – unstable; consistence is fine; the colour is reddish brown, 5YR 4/4; fresh, roots abundance is common; 60 % of skeleton composed of sharp-edged particles up to 10 cm; C/N proportion is characteristic for mull to already moder mull.

II: 32–97 cm; fine angular blocky sandy loam, poorly humose to mineral; weakly distinct peds – unstable; consistence is fine; the colour is dark brown to brown 7.5YR 4/4; fresh, roots abundance is common; 80 % of skeleton composed of sharp-edged particles up to 5 cm in size; C/N proportion is characteristic for mull.

III: 97+ cm; very thick stones and rocks bigger than 20 cm

| HORIZON | depth | pH | P ₂ O ₅ | K ₂ O | org. | C | CN | N | | | | | | |
|---------|----------|-----------------------------------|-------------------------------|------------------|--------|-------|-------|--------|------|------|-----|-----|------|---|
| | | CaCl ₂ | AL | AL | matter | % | prop. | toget. | | | | | | |
| | | AMMONIUM extraction | | | | | | | | | | | | |
| HORIZON | depth | Ca | Mg | K | Na | H | S | T | V | Ca | Mg | K | Na | H |
| | | mmol C _e / 100g sample | | | | | | | | | | | | |
| (A) | 0–11 cm | 4.8 | 1.7 | 17.5 | 6.3 | 3.6 | 13.8 | 0.26 | | | | | | |
| I | 11–32 cm | 4.5 | | | 1.5 | 0.9 | 15.0 | 0.06 | | | | | | |
| II | 32–97 cm | 4.9 | | | 1.1 | 0.6 | 12.0 | 0.05 | | | | | | |
| (A) | 0–11 cm | 5.11 | 1.26 | 0.42 | 0.01 | 15.80 | 6.8 | 22.6 | 30.1 | 22.6 | 5.6 | 1.9 | 69.9 | |
| I | 11–32 cm | | | | | | | | | | | | | |
| II | 32–97 cm | | | | | | | | | | | | | |

NOTE: Up to 0.5 cm of dark humus on the surface above (A) horizon, mostly brown alluvium.

We distinguish two variants within the subassociation; the variant *typica*, whose tree layer is dominated by the species *Acer pseudoplatanus* and the variant with the species *Fraxinus excelsior*, whose dominant tree species is *Fraxinus excelsior*.

Holotype of the subassociation *Dryopterido affini-Aceretum polystichetosum setiferi* is relevé No. 8 in Table 5 hoc loco.

Subassociation D.-A. leucojetosum vernae subass. nova hoc loco (Table 5/ 20–37) occurs in the montane and partly also in the altimontane belt of the Pohorje massif, where it overgrows steep colluvial slopes (not necessarily above streams) and slopes of torrential ditches. Compared to the stands of the other two subassociations it grows at higher al-

titudes and on less moist soils. Differential species of the subassociation, which indicate above all the thriving of these stands in the montane belt, are: *Leucjum vernum*, *Calamagrostis arundinacea*, *Polygonatum verticillatum*, *Dentaria bulbifera*, *Paris quadrifolia* and *Festuca altissima*. *Calamagrostis arundinacea* indicates the thriving of the stands on moderately acidic sites and more considerable inclines. In the stands of this association also the species *Sorbus aucuparia* occurs occasionally in the tree layer, although it was not found at lower altitudes of these stands.

Three variants were distinguished within the subassociation *leucojetosum vernae*: the variant *typica*, where the tree layer is dominated by the species *Acer pseudoplatanus*, the variant with the species

Fraxinus excelsior (as the most initial within this subassociation), where the tree layer is dominated by *Fraxinus excelsior*, and at highest altitudes the variant with the species *Saxifraga rotundifolia* (altimontane belt) with *Saxifraga rotundifolia*, *Cicerbita alpina*, *Ribes petraeum* and *Viola biflora* as differential species.

Within the syntaxon *D.-A. leucojetosum vernae* var. *typica* two previously published relevés are also included, namely the two relevés published by Marinček (1995b, Table 3/1–2) named *Acer pseudo-*

platanus-Ulmus glabra (nom. prov.) are included in Table 5 as relevés no. 31 and no. 35.

The soil profile was made within the variant with the species *Fraxinus excelsior*. Colluvial dystric brown soil (Cumuli Dystric Cambisol) occurs (Table 4).

Holotype of the subassociation *Dryopterido affini-Aceretum leucojetosum vernae* is relevé No. 26 in Table 5 hoc loco.

Table 4: Soil profile description (profile 4)

Tabela 4: Opis pedološkega profila (profil 4)

Profile 4

Locality: Pohorje, Fram-Ranče, relevé No. 24 (Table5), the middle of the slope, non- rocky, northern exposition

Bedrock: metamorphic slates

Soil type: Dystric brown soil,colluvial (CUMULI DYSTRIC CAMBISOL)

Profile description:

Ol: 1–0; evenly covers Oh; maple, beech and ash foliage, herb remains

Oh: 0–2 cm; cloddy structure, mostly organic matter; weakly distinct peds – unstable; of loose and friable consistence; the colour is dark brown, 7,5YR 3/2; dry to fresh, many fine and medium roots; skeleton is singular, sharp-edged up to 2 cm in size; C/N proportion is still characteristic for mull

A: 2–25 cm; silty loam of cloddy structure, humose; weakly distinct peds – unstable; of loose and fine consistence; the colour is brown to dark brown, 7,5YR 4/4; fresh, abundant roots; 30 % of skeleton composed of sharp-edged particles up to 5 cm in size; C/N proportion is characteristic for moder

Ab: 25–51 cm; subangular blocky loam, very humose; weakly distinct peds – rather unstable; of loose and friable consistence; the colour is dark reddish brown, 5YR 3/2,5; fresh, abundant roots; 30 % of skeleton composed of sharp-edged particles up to 5 cm in size; C/N proportion is characteristic for moder.

Note: buried horizon-former surface horizon.

Bv: 5 –120+ cm; small angular blocky loam, medium humose; weakly distinct peds – rather unstable; of loose and friable consistence; the colour is brown to dark brown, 7,5YR 4/4; fresh, roots abundance is common; 40 % of skeleton composed of sharp-edged particles up to 5 cm in size; C/N proportion is characteristic for mull.

| HORIZON | depth | pH | P ₂ O ₅ AL | K ₂ O AL | org. matter | C | CN prop. | N | sand | silt coarse | silt fine | silt toget. | clay | text. class |
|---------|-----------|-------------------|-------------------------------------|------------------------|----------------|------|-------------|------|------|----------------|--------------|----------------|------|----------------|
| | | CaCl ₂ | ---mg/100g--- | | % | % | | % | % | % | % | % | % | |
| Oh | 0– 2 cm | 4.3 | | | 37.1 | 21.5 | 14.9 | 1.44 | | | | | | |
| A | 2– 25 cm | 4.2 | 1.3 | 8.4 | 8.3 | 4.8 | 21.8 | 0.22 | 53.0 | 13.9 | 19.2 | 33.1 | 12.9 | SL |
| Ab | 25– 51 cm | 4.3 | 0.5 | 5.0 | 10.7 | 6.2 | 23.8 | 0.26 | 39.2 | 15.6 | 22.2 | 37.8 | 23.0 | L |
| Bv | 51–120 cm | 4.6 | | | 3.9 | 2.3 | 14.4 | 0.16 | 40.5 | 17.8 | 21.2 | 38.8 | 20.7 | L |

AMMONACETATE extraction

| HORIZON | depth | Ca | Mg | K | Na | H | S | T | V | Ca | Mg | K | Na | H | | |
|---------|-----------|-----------------------------------------------|------|------|------|-------|-----|------|-----|-----|-----|-----|-----|------|--|--|
| | | ----- mmol C _e / 100g sample ----- | | | | | | | | | | | | | | |
| | | | | | | | | | % | % | % | % | % | % | | |
| Oh | 0– 2 cm | | | | | | | | | | | | | | | |
| A | 2– 25 cm | 0.37 | 0.21 | 0.17 | 0.01 | 27.00 | 0.8 | 27.8 | 2.9 | 1.3 | 0.8 | 0.6 | | 97.1 | | |
| Ab | 25– 51 cm | 0.20 | 0.15 | 0.11 | 0.01 | 33.70 | 0.5 | 34.2 | 1.5 | 0.6 | 0.4 | 0.3 | | 98.5 | | |
| Bv | 51–120 cm | 0.24 | 0.10 | 0.10 | 0.02 | 26.30 | 0.5 | 26.8 | 1.9 | 0.9 | 0.4 | 0.4 | 0.1 | 98.1 | | |

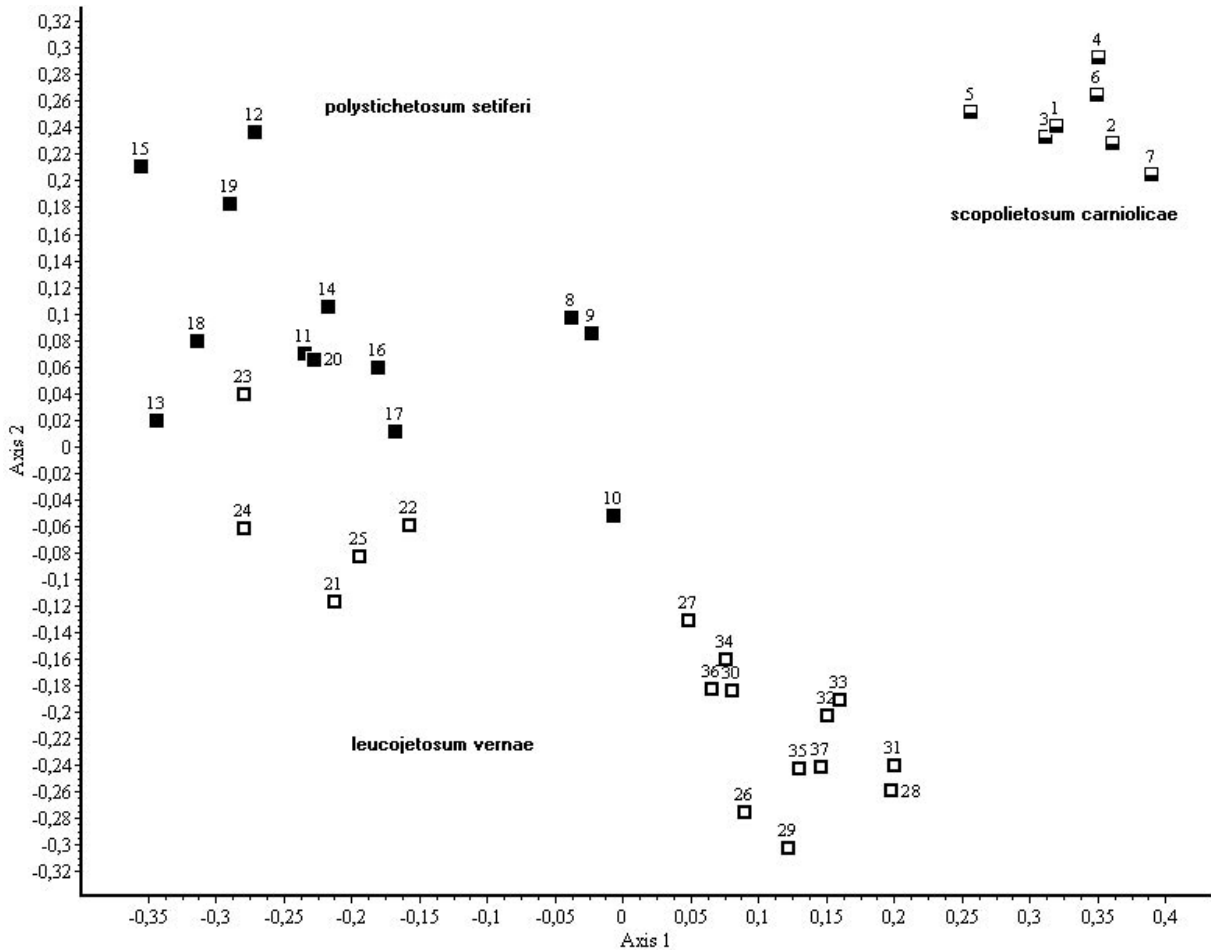


Figure 4: Ordination of the relevés of the association *Dryopterido affini-Aceretum* after the analytic table (Table 5). Legend: \blacksquare – *D.-A. scopolietosum carniolicae*, \blacksquare – *D.-A. polystichetosum setiferi* (var. *typica*: relevés 8–10, var. *Fraxinus excelsior*: relevés 11–20), \square – *D.-A. leucojetosum vernaе* (var. *Fraxinus excelsior*: relevés 21–25, var. *typica*: relevés 26–35, var. *Saxifraga rotundifolia*: relevés 36–37).

Slika 4: Ordinacija popisov asociacije *Dryopterido affini-Aceretum* po analitični tabeli (Tabela 5). Legenda: \blacksquare – *D.-A. scopolietosum carniolicae*, \blacksquare – *D.-A. polystichetosum setiferi* (var. *typica*: popisi 8–10, var. *Fraxinus excelsior*: popisi 11–20), \square – *D.-A. leucojetosum vernaе* (var. *Fraxinus excelsior*: popisi 21–25, var. *typica*: popisi 26–35, var. *Saxifraga rotundifolia*: popisi 36–37).

Ordination of the relevés of the association *Dryopterido affini-Aceretum* is presented in **Figure 4**. The stands of the two geographical races clearly separate along axis 1, as do within the geographical race *D.-A. var. geogr. Dentaria trifolia* also the maple stands (from the syntaxa *D.-A. polystichetosum setiferi* var. *typica* and *D.-A. leucojetosum vernaе* var. *typica* and var. *Saxifraga rotundifolia*), which separate from the stands with european ash tree (from the syntaxa *D.-A. polystichetosum setiferi* var. *Fraxinus excelsior* and *D.-A. leucojetosum vernaе* var. *Fraxinus excelsior*). The relevés along axis 2 were arranged with regard to altitude. In accordance with the previous findings the stands of the subassociations *D.-A. scopolietosum*

carniolicae and *D.-A. polystichetosum setiferi* overgrow the lower sites and the stands of the subassociation *D.-A. leucojetosum*, the stands at higher altitudes.

3.e The syntaxonomical classification of the association (Synoptic Table 6):

For a long time, the synsystematic classification of forests of valuable broad-leaved trees in the region of the Illyrian floral province was unclear. The following opinions prevailed regarding the synsystematic classification: 1. classification into the alliance *Aremonio-Fagion* (Horvat 1938, 1962, Glavač 1958),

and further either into an independent suballiance of Illyrian forests of valuable broad-leaved trees *Polysticho setiferi-Acerenion* Borhidi & Kevey 1996 (or *Lamio orvalae-Acerenion* Marinček 1990) (Borhidi & Kevey 1996, Kevey 1997, Kevey & Borhidi 1998, Borhidi 2003, Poldini & Nardini 1993, Marinček 1990, 1995, P. Košir & Marinček 1999, Dakskobler 1999, P. Košir 2000, 2002) or within the suballiance of montane beech forests *Lamio orvalae-Fagenion* (Accetto 1991, Vukelić & Rauš 1998); 2. classification within the Central-European alliance *Tilio-Acerion*, but as a specific geographical race of Central-European associations (Zupančič 1996, Zupančič & Žagar 1999) or 3. classification into an independent alliance of forests of valuable broad-leaved trees of the Illyrian floral province *Fraxino-Acerion* (Fukarek 1969, Jovanović & al. 1986, Stefanović 1986). The latest research (P. Košir 2004) has shown that the forests of valuable broad-leaved trees of the Illyrian floral province can be classified into an independent alliance *Fraxino-Acerion* within the order *Fagetalia sylvaticae*. The results of the latest research (P. Košir 2004) were considered in this article too.

The synoptic table (Table 6) gives a comparison of the studied syntaxon with certain syntaxa of the Illyrian forests of valuable broad-leaved trees, and a comparison with the similar syntaxa on silicate bedrock from Central Europe. The table demonstrates the presence of the differential species of the association *Dryopterido affini-Aceretum*, character species of the alliance of Illyrian forests of valuable broad-leaved trees, regional character species of the alliance *Fraxino-Acerion* and the species of Illyrian alliances within the order *Fagetalia sylvaticae*, *Aremonio-Fagion* and *Erythronio-Carpinion*, which occur in the region of the Illyrian floral province also in the forests of valuable broad-leaved trees of the alliance *Fraxino-Acerion*. Regionally characteristic species (Dierschke 1994) are those which are at the same time characteristic for the alliance of Illyrian forests of valuable broad-leaved trees in the Illyrian floral province and differential (species) towards the alliance *Aremonio-Fagion*, as well as being characteristic for Central-European forests of valuable broad-leaved trees of the alliance *Tilio-Acerion* in the region of the Central-European province. As is evident in the synoptic table, they occur in Illyrian and Central-European forests of valuable broad-leaved trees.

The diagnostic species of the alliance *Fraxino-Acerion* are well represented in the described association; the species of the alliance *Aremonio-Fagion* also occur. This unquestionably places the association

among the Illyrian forests of valuable broad-leaved trees and differentiates it from the similar stands of the alliance *Tilio-Acerion* in Central-Europe.

The community described was synsystematically classified as follows:

Quercu-Fagetea Br.-Bl. et Vlieger in Vlieger 1937

Fagetalia sylvaticae Pawłowski in Pawłowski et al. 1928

Fraxino-Acerion Fukarek 1969

Dryopterido affini-Aceretum ass. nova hoc loco

As an example of Central-European stands we selected two syntaxa on silicate bedrock (Tab. 6/13, 14) which were described in Central Europe and are most similar to this association regarding the presence of the differential species of the association *Dryopterido affini-Aceretum*. Syntaxon (Tab. 6/13) comprises the stands described in southwestern Styria in Austria (Sturm 1978), i.e. in the borderline region of the Illyrian floral province, which gives the stands a transitional character. There is also a small proportion of species from the alliances *Fraxino-Acerion* and *Aremonio-Fagion* in this region. This is completely unlike the syntaxon (Tab. 6/14) from Germany (Büker 1942), where all of the character species from the alliances *Fraxino-Acerion* and *Aremonio-Fagion* are missing.

4. CONCLUSION

Forests of valuable broad-leaved trees on silicate bedrock in the submontane and montane belt have been extensively researched in Slovenia. A new association *Dryopterido affini-Aceretum* has been described, classified into the alliance of Illyrian forests of valuable broad-leaved trees *Fraxino-Acerion*. In the future it will be necessary to conduct a more thorough research of the stands of valuable broad-leaved trees on silicate bedrock also in the altimontane belt. In this study, these stands were presented with only two relevés and classified temporarily in the frame of association *Dryopterido affini-Aceretum* as variant with species *Saxifraga rotundifolia*. Further investigations will reveal whether classification of these stands is suitable, or whether they should be classified into the frame of association *Lamio orvalae-Aceretum* P. Košir et Marinček 1999, which is Illyrian forest of valuable broad-leaved trees of the altimontane belt, so far described only on carbonate bedrock (P. Košir 2004).

5. POVZETEK

Gozdovi plemenitih listavcev na nekarbonatni podlagi (*Dryopterido affini-Aceretum* ass. nova hoc loco) v Sloveniji

Na nekarbonatni podlagi smo na območju ilirske florne province opisali novo asociacijo *Dryopterido affini-Aceretum*. Sestoje asociacije smo našli v submontanskem in montanskem (deloma altimontanskem) pasu na območju Pohorja in Litije v predalpskem in alpskem območju Slovenije. Na Pohorju se sestoji plemenitih listavcev pojavljajo v širšem območju razširjenosti asociacije *Cardamine savensis-Fagetum* var. *Abies alba*, kontaktna združba sestojev z območja Litije pa je *Blechno-Fagetum*.

Popisovali smo po standardni srednjeevropski metodi (Braun-Blanquet 1964), talne razmere pa smo proučili s pomočjo reprezentančnih talnih profilov. Pri obdelavi in analizi fitocenoloških popisov in njihovi sintaksonomski uvrstitvi smo si pomagali tudi z ordinacijsko metodo glavnih koordinat (PcoA) iz računalniškega paketa SYN-TAX 2000 (Podani 2001). Mera različnosti je bila komplement koeficienta »similarity ratio«. Asociacijo smo členili na nižje sintaksonomske enote po načelu večrazsežne členitve vegetacijskih enot (W. & A. Matuszkiewicz 1981).

Sestoji asociacije poraščajo strma koluvialna pobočja, vznožja pobočij, pobočja ozkih dolin pogosto nad vodotoki ter pobočja hudourniških jarkov. Prevladujejo koluvialna distrična tla, pojavljajo se tudi ranker in koluvialno-deluvialna distrična rjava tla. Tla imajo relativno visoke vrednosti kationske izmenjevalne kapacitete, v primerjavi s tlemi na karbonatni matični podlagi pa imajo manjšo vsebnost bazičnih kationov. C/N-razmerja so zaradi nižjih pH-vrednosti v splošnem manj ugodna in pomenijo biološko manj aktivna tla. Neprekinjeno biološko kroženje snovi je zagotovljeno s koluvialnostjo tal in s tem s stalnim donosom organskih snovi in vode, ki omogočajo, da mineralizacija kljub nižjim pH vrednostim poteka relativno hitro.

Razlikovalne vrste asociacije *Dryopterido affini-Aceretum* so *Dryopteris affinis*, *Luzula luzuloides*, *Dryopteris dilatata*, *Phegopteris connectilis* in *Gymnocarpium dryopteris*. Naštete vrste, ki optimalno uspevajo na kisljih nekarbonatnih kamninah, označujejo zmerno acidofilni značaj asociacije in jih uvrščamo v razred *Vaccinio-Piceetea*. Vrsta *Dryopteris affinis*, po kateri ima združba ime, se v sestojih pojavlja najpogosteje in z velikimi pokrovnimi vrednostmi.

Asociacijo smo členili na dve geografski varian-

ti: *D.-A.* var. geogr. *typica* (Litija) in *D.-A.* var. geogr. *Dentaria trifolia* (Pohorje). Ekološko pa smo asociacijo členili v tri subasociacije: *D.-A. scopoliotosum carniolicae* v submontanskem pasu na najbolj kisljih in najbolj vlažnih rastiščih, *D.-A. polystichetosum setiferi* v submontanskem pasu na vlažnih in najtoplejših rastiščih in subasociacijo *D.-A. leucojetosum vernaе* na večjih nadmorskih višinah (montanski in delno altimontanski pas) in na manj vlažnih tleh. V okviru subasociacije *D.-A. polystichetosum setiferi* in subasociacije *D.-A. leucojetosum vernaе* smo ločili tipično varianto, kjer v sestojih prevladuje *Acer pseudoplatanus*, in varianto z vrsto *Fraxinus excelsior*, kjer v drevesni plasti prevladuje *Fraxinus excelsior*. V okviru subasociacije *D.-A. leucojetosum* smo izločili še varianto z vrsto *Saxifraga rotundifolia*, ki se pojavlja v altimontanskem pasu.

Obravnavane sestoje smo v sinoptični tabeli primerjali z drugimi ilirskimi javorjevimi sestoji in sorodnimi srednjeevropskimi javorjevimi gozdovi na silikatu. Asociacijo smo uvrstili v samostojno zvezo ilirskih gozdov plemenitih listavcev *Fraxino Acerion* Fukarek 1969.

6. ACKNOWLEDGMENT

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Figure 5: Soil profiles in the association *Dryopterido affini-Aceretum* (from left to right: dystric brown soil-colluvial, dystric leptosol, colluvial-delluvial dystric soil).

Slika 5: Tla v asociaciji *Dryopterido affini-Aceretum* (od leve proti desni: koluvialna distrična rjava tla, ranker, koluvialno-deluvialna distrična tla).



Figure 6: *Dryopterido affini-Aceretum polystichetosum setiferi* v začetku junija

Slika 6: *Dryopterido affini-Aceretum polystichetosum setiferi* v začetku junija

8. APPENDIX

Appendix to table 5:

Relevé locations: **1.** Litija, ravine under Špik, **2.** Litija, Breg near Litija, **3.** Litija, Breg near Litija, **4.** Litija, ravine under Špik **5.** Litija, ravine under Špik, **6.** Litija, ravine under Špik, **7.** Litija, ravine under Špik, **8.** Pohorje, along the stream Lobničica above Ruše, **9.** Pohorje, along the stream Lobničica above Ruše, **10.** Pohorje, valley of Lobnica, **11.** Pohorje, along the stream Lobničica above Ruše, **12.** Pohorje, valley of Lobnica, **13.** Pohorje, from Ruška koča towards Ruše, **14.** Pohorje, valley of Lobnica, **15.** Pohorje, valley of Lobnica, **16.** Pohorje, from Ruška koča towards Ruše, **17.** Pohorje, valley of Lobnica, **18.** Pohorje, valley of Lobnica, **19.** Pohorje, valley of Lobnica, **20.** Pohorje, along the stream Lobničica above Ruše, **21.** Pohorje, Fram Ranče, **22.** Pohorje, Fram Ranče, **23.** Pohorje, Fram Ranče, **24.** Pohorje, Fram Ranče, **25.** Pohorje, Fram Ranče, **26.** Pohorje, above Bistrica ob Dravi, **27.** Pohorje, from Ribnica on Pohorje towards Rogla, **28.** Pohorje, Šumik virgin forest, **29.** Pohorje, Šumik virgin forest, **30.** Pohorje, from Ribnica on Pohorje towards Rogla **31.** Marinček (1995b), *Acer pseudoplatanus-Ulmus glabra* (nom. prov.), table 3, relevé no. 1, Šumik, **32.** Pohorje, Šumik virgin forest, **33.** Pohorje, Šumik virgin forest, **34.** Pohorje, Šumik virgin forest, **35.** Marinček (1995b), *Acer pseudoplatanus-Ulmus glabra* (nom. prov.), table 3, relevé no. 2, Šumik, **36.** Pohorje, Ribnica on Pohorje, **37.** Pohorje, Ribnica on Pohorje.

The species occurring only once in the Table (rare species): **FA**; *Tilia platyphyllos* Ia 23 (+), *Phyllitis scolopendrium* III 33 (+), **F**; *Pulmonaria stiriaca* III 1 (+), *Prunus avium* Ia 15 (+), *Euphorbia amygdaloides* III 27 (+), *Galium schultesii* III 30 (+), *Epipactis helleborine* III 36 (+), **QF**; *Hypericum montanum* III 10 (+), *Hepatica nobilis* III 17 (+), *Melica nutans* III 17 (+), *Betonica officinalis* III 33 (+), *Polygonatum odoratum* III 36 (+), **AU**; *Myosotis scorpioides* III 1 (+), *Carex pendula* III 4 (+), *Caltha palustris* III 14 (+), *Equisetum arvense* III 16 (+), *Lysimachia nemorum* III 16 (+), *Crepis paludosa* III 19 (+), *Cardamine impatiens* III 22 (+), *Geranium phaeum* III 23 (+), *Listera ovata* III 36 (+), **VP**; *Galium rotundifolium* III 29 (+), *Avenella flexuosa* III 32 (+), *Hieracium lachenalii* III 32 (+), *Lonicera nigra* II 37 (+), *Lonicera nigra* III 37 (+), **A**; *Aconytum vulparia* III 36 (+), **O**; *Eupatorium cannabinum* III 1 (r), *Pseudotsuga menziensis* Ia 5 (1), *Prunella vulgaris* III 10 (r), *Carex divulsa* III 12 (+), *Cirsium erisithales* III 12 (+), *Pteridium aquilinum* III 13 (+), *Poa trivialis* III 15 (+), *Galium aparine* III 23 (+), *Betula pendula* Ib 32 (+), *Fragaria vesca* III 32 (+), **M**; *Polytrichum commune* IV 1 (+), *Mnium hornum* IV 2 (+), *Pseudotaxiphyllum elegans* IV 4 (+), *Plagiothecium laetum* IV 5 (+), *Bazzania trilobata* IV 7 (+), *Brachythecium campestre* IV 13 (+), *Eurhynchium striatum* IV 14 (+), *Rhynchostegium rotundifolium* IV 16 (+), *Brachythecium velutinum* IV 21 (+), *Fissidens taxifolius* IV 21 (+), *Rhytidiadelphus triquetrus* IV 26 (+), *Apometzgeria pubescens* IV 30 (+), *Hypnum cupressiforme* var. *filiforme* IV 30 (+), *Isoetecium myosuroides* IV 30 (+), *Eurhynchium schleicheri* IV 31 (+), *Bartramia halleriana* IV 35 (+), *Ptilium crista-castrensis* IV 35 (+), *Brachythecium reflexum* IV 36 (+).

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Table 5: Analytic table of the association *Dryopterido affini-Aceretum* ass. nova hoc loco

Tabela 5: Analična tabela asociacije *Dryopterido affini-Aceretum* ass. nova hoc loco

| Relevé number | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|-------------------------------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Date: | day | 15 | 24 | 24 | 5 | 5 | 5 | 5 | 11 | 11 | 22 | 11 | 3 | 22 | 3 | 3 | 22 | 22 | 22 |
| | month | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 6 | 5 | 6 | 6 | 5 | 6 | 6 | 5 | 5 | 5 |
| | year | 2000 | 2000 | 2000 | 2000 | 2000 | 2000 | 2000 | 2002 | 2002 | 2002 | 2002 | 2002 | 2002 | 2002 | 2002 | 2002 | 2002 | 2002 |
| Relevé area (m2) | | 200 | 300 | 400 | 200 | 300 | 200 | 400 | 400 | 400 | 300 | 400 | 200 | 200 | 300 | 200 | 200 | 400 | 400 |
| Altitude (m) | | 435 | 275 | 280 | 330 | 350 | 310 | 320 | 400 | 410 | 690 | 400 | 410 | 780 | 430 | 435 | 730 | 610 | 480 |
| Aspect | | NE | E | E | E | SW | NE | NE | E | E | E | W | S | EES | EES | S | SE | E | E |
| Slope (degrees) | | 30 | 30 | 25 | 25 | 30 | 5 | 30 | 30 | 45 | 30 | 40 | 35 | 15 | 5 | 40 | 25 | 40 | 40 |
| Cover bare rock (%) | | 0 | 30 | 0 | 0 | 0 | 0 | 0 | 10 | 5 | 20 | 0 | 0 | 20 | 5 | 0 | 5 | 30 | 5 |
| Cover of separate layers (%): | | | | | | | | | | | | | | | | | | | |
| Upper tree layer | Ia | 60 | 80 | 60 | 70 | 80 | 60 | 80 | 80 | 85 | 70 | 70 | 80 | 75 | 90 | 80 | 90 | 70 | 70 |
| Lower tree layer | Ib | 5 | 5 | 20 | 30 | 50 | 10 | 20 | 40 | 20 | 10 | 40 | 50 | 40 | 40 | 50 | 50 | 50 | 20 |
| Shrub layer | II | 5 | 30 | 20 | 5 | 20 | 5 | 5 | 40 | 40 | 5 | 10 | 30 | 10 | 60 | 20 | 10 | 25 | 20 |
| Herb layer | III | 90 | 90 | 100 | 80 | 80 | 100 | 100 | 100 | 90 | 100 | 90 | 80 | 80 | 90 | 60 | 80 | 100 | 100 |
| Moss layer | IV | 5 | 10 | 5 | 5 | 5 | 0 | 20 | 5 | 5 | 10 | 10 | 0 | 10 | 60 | 0 | 5 | 20 | 0 |

| | | | | | | | | | | | | | | | | | | | |
|--------------------------------------|--|--|--|--|--|--|--|--|--|-------------------------------------|--|--|--|--|--|--|--|--|--|
| var. <i>geogr.typica</i> | | | | | | | | | | | | | | | | | | | |
| <i>scopolietosum carniolicae</i> (a) | | | | | | | | | | <i>polystichetosum setiferi</i> (b) | | | | | | | | | |
| var. <i>typica</i> | | | | | | | | | | var. <i>Fraxinus excelsior</i> | | | | | | | | | |

DIFFERENTIAL SPECIES OF THE ASSOCIATION

| | | | | | | | | | | | | | | | | | | | | |
|----|--------------------------------|-----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VP | <i>Dryopteris affinis</i> | III | 1 | 1 | 1 | 1 | 2 | + | 1 | + | 1 | 2 | 3 | 1 | + | + | + | 1 | 1 | 2 |
| VP | <i>Dryopteris dilatata</i> | III | + | + | . | + | + | + | + | . | . | . | . | . | . | + | . | . | + | . |
| VP | <i>Luzula luzuloides</i> | III | . | . | + | + | + | + | + | . | . | . | . | + | . | . | + | . | + | + |
| VP | <i>Phegopteris connectilis</i> | III | + | + | . | + | . | . | + | . | . | . | + | . | . | . | . | . | + | . |
| VP | <i>Gymnocarpium dryopteris</i> | III | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | . | . | . |

DIFFERENTIAL SPECIES OF GEOGRAPHICAL RACE

| | | | | | | | | | | | | | | | | | | | | |
|----|----------------------------------|-----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AF | <i>Dentaria trifolia</i> | III | . | . | . | . | . | . | . | . | . | 1 | 1 | . | . | 1 | + | . | + | . |
| VP | <i>Abies alba</i> | Ia | . | . | . | . | . | . | . | . | . | . | 1 | . | . | 1 | . | . | . | . |
| VP | <i>Abies alba</i> | Ib | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | + |
| VP | <i>Abies alba</i> | II | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . |
| VP | <i>Abies alba</i> | III | . | . | . | . | . | . | . | . | . | . | . | + | + | + | 1 | . | + | . |
| VP | <i>Hieracium transsylvanicum</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . |

DIFFERENTIAL SPECIES OF SUBASS. AND. VAR.

| | | | | | | | | | | | | | | | | | | | | |
|----|---------------------------------|-----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FA | <i>Scopolia carniolica</i> | III | 3 | 3 | 3 | 3 | 1 | 3 | 4 | . | . | . | . | . | . | . | . | . | . | . |
| VP | <i>Blechnum spicant</i> | III | r | + | + | + | + | . | . | . | . | . | . | . | . | . | . | . | . | . |
| AU | <i>Alnus glutinosa</i> | Ia | 2 | 1 | . | 1 | + | . | . | . | . | . | . | . | . | . | . | . | . | . |
| AU | <i>Alnus glutinosa</i> | Ib | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| AU | <i>Alnus glutinosa</i> | II | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| AU | <i>Cardamine amara</i> | III | 1 | + | + | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| AU | <i>Equisetum pratense</i> | III | . | . | + | . | . | + | . | . | . | . | . | . | . | . | . | . | . | . |
| FA | <i>Polystichum setiferum</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| FA | <i>Polystichum x bicknellii</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| FA | <i>Polystichum x wirtgenii</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 2 |
| QF | <i>Aegopodium podagraria</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| QF | <i>Brachypodium sylvaticum</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| FA | <i>Glechoma hirsuta</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |

| | | | | | | | | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|------|-----|------|------|------|-----|------|------|
| 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 |
| 3 | 11 | 29 | 29 | 29 | 29 | 29 | 11 | 14 | 21 | 21 | 14 | | 21 | 21 | 21 | | 14 | 14 |
| 6 | 6 | 5 | 5 | 5 | 5 | 5 | 7 | 6 | 5 | 5 | 6 | | 5 | 5 | 5 | | 6 | 6 |
| 2002 | 2002 | 2002 | 2002 | 2002 | 2002 | 2002 | 2003 | 2002 | 2002 | 2002 | 2002 | | 2002 | 2002 | 2002 | | 2002 | 2002 |
| 400 | 200 | 400 | 400 | 200 | 400 | 200 | 400 | 400 | 400 | 400 | 400 | | 400 | 400 | 200 | | 400 | 400 |
| 400 | 405 | 780 | 800 | 690 | 790 | 800 | 910 | 890 | 950 | 950 | 850 | 890 | 980 | 830 | 755 | 850 | 1160 | 1210 |
| NE | EEN | NE | NE | NE | NE | NE | NNW | N | NW | NW | E | E | NNW | NW | NE | E | NE | NNE |
| 35 | 10 | 30 | 30 | 5 | 35 | 35 | 25 | 35 | 15 | 20 | 35 | 20 | 60 | 30 | 30 | 20 | 20 | 20 |
| 35 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 5 | 20 | 10 | 40 | 15 | 80 | 5 | 10 | 30 | 10 | 60 |
| 70 | 70 | 80 | 60 | 90 | 75 | 75 | 90 | 90 | 90 | 70 | 90 | 70 | 40 | 70 | 70 | 70 | 70 | 60 |
| 60 | 60 | 10 | 20 | 20 | 40 | 20 | 10 | 30 | 10 | 5 | 20 | 0 | 20 | 0 | 10 | 0 | 30 | 20 |
| 15 | 30 | 20 | 30 | 10 | 60 | 30 | 5 | 10 | 5 | 5 | 10 | 2 | 10 | 5 | 10 | 50 | 5 | 5 |
| 70 | 75 | 90 | 100 | 100 | 90 | 100 | 80 | 90 | 80 | 90 | 70 | 60 | 30 | 100 | 90 | 60 | 90 | 70 |
| 20 | 5 | 0 | 0 | 0 | 1 | 0 | 5 | 5 | 10 | 5 | 30 | 5 | 70 | 20 | 5 | 10 | 5 | 20 |

| | | | | | | | | | | | | | | | | | | |
|--------------------------------------|--|--|--|--|--|--------------------|--|--|--|--|--|--|--|--|--|----------------|--|--|
| var. geogr. <i>Dentaria trifolia</i> | | | | | | | | | | | | | | | | | | |
| <i>leucojetosum vernaе</i> (c) | | | | | | | | | | | | | | | | | | |
| var. <i>Fraxinus exc.</i> | | | | | | var. <i>typica</i> | | | | | | | | | | var. Sax. Rot. | | |

presence
frequency
presence (a)
frequency (a)
presence (b)
frequency (b)
presence (c)
frequency (c)

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|----|----|---|-----|----|-----|----|----|
| 2 | + | 1 | 1 | 1 | 1 | 1 | 1 | 2 | . | . | 1 | . | . | 2 | 1 | . | . | . | 30 | 81 | 7 | 100 | 13 | 100 | 10 | 59 |
| . | . | . | . | + | . | . | . | + | + | + | + | + | + | + | + | . | + | + | 19 | 51 | 6 | 86 | 2 | 15 | 11 | 65 |
| + | . | + | + | . | + | + | . | . | . | . | . | . | 1 | . | . | . | + | + | 17 | 46 | 5 | 71 | 5 | 38 | 7 | 41 |
| + | + | . | . | . | + | + | . | . | . | . | + | 1 | + | + | . | + | . | 2 | 16 | 43 | 4 | 57 | 4 | 31 | 8 | 47 |
| 1 | + | + | + | . | 1 | . | . | + | . | + | . | + | 1 | . | . | . | + | 11 | 30 | . | . | 3 | 23 | 8 | 47 | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|----|---|---|---|----|----|----|
| . | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | + | + | 1 | 1 | . | . | + | + | + | 2 | 21 | 57 | . | . | 6 | 46 | 15 | 88 |
| + | . | . | . | . | + | . | . | . | . | . | . | + | + | . | + | . | + | . | 8 | 22 | . | . | 3 | 23 | 5 | 29 |
| . | 1 | . | + | . | . | + | + | . | . | . | + | . | . | . | . | . | . | . | 8 | 22 | . | . | 4 | 31 | 4 | 24 |
| . | + | + | . | . | + | . | . | . | . | . | + | . | + | . | . | . | . | . | 6 | 16 | . | . | 2 | 15 | 4 | 24 |
| . | . | . | . | . | . | . | + | + | + | . | + | + | + | . | . | . | . | . | 14 | 38 | . | . | 8 | 62 | 6 | 35 |
| + | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 2 | 5 | . | . | 2 | 15 | . | . |

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|---|-----|---|---|---|---|
| . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 7 | 19 | 7 | 100 | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 5 | 14 | 5 | 71 | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 4 | 11 | 4 | 57 | . | . | . | . |
| . | . | . | . | + | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | 3 | . | . | . | . | 1 | 6 |
| . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | 1 | 3 | . | . | . | . | 1 | 6 |
| . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 3 | 8 | 3 | 43 | . | . | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 2 | 5 | 2 | 29 | . | . | . | . |

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|----|---|---|----|-----|---|---|
| + | 2 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 13 | 35 | . | . | 13 | 100 | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 6 | 16 | . | . | 6 | 46 | . | . |
| . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | 3 | . | . | 1 | 8 | . | . |
| . | . | . | . | 3 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 10 | 27 | . | . | 9 | 69 | 1 | 6 |
| + | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | . | . | . | 10 | 27 | . | . | 9 | 69 | 1 | 6 |
| . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 5 | 14 | . | . | 5 | 38 | . | . |

| Relevé number | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | | |
|---------------|----------------------------------|-----|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|---|---|
| F | <i>Paris quadrifolia</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | | |
| F | <i>Leucojum vernum</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | . | | |
| VP | <i>Calamagrostis arundinacea</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + | + | |
| A | <i>Polygonatum verticillatum</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | . | . | |
| F | <i>Dentaria bulbifera</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| F | <i>Festuca altissima</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| FA | <i>Fraxinus excelsior</i> | Ia | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| FA | <i>Fraxinus excelsior</i> | Ib | . | . | . | . | . | . | 1 | . | . | . | . | 1 | 1 | 1 | 1 | + | + | + | 1 |
| FA | <i>Fraxinus excelsior</i> | II | . | . | . | . | . | . | 1 | 2 | . | . | . | . | + | 1 | + | . | + | 1 | |
| FA | <i>Fraxinus excelsior</i> | III | . | . | . | . | . | . | . | + | . | + | . | . | 1 | + | . | . | . | . | |
| A | <i>Saxifraga rotundifolia</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| A | <i>Cicerbita alpina</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| A | <i>Ribes petraeum</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| A | <i>Viola biflora</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| FA | FRAXINO-ACERION | | | | | | | | | | | | | | | | | | | | |
| | <i>Acer pseudoplatanus</i> | Ia | 2 | 4 | 3 | 3 | 3 | 3 | 4 | 5 | 5 | 4 | + | 1 | + | + | . | 2 | + | . | |
| | <i>Acer pseudoplatanus</i> | Ib | . | + | . | . | + | + | + | + | + | + | . | . | . | + | 1 | 3 | . | . | |
| | <i>Acer pseudoplatanus</i> | II | + | + | + | + | . | + | + | . | + | . | . | . | 1 | . | . | . | . | + | |
| | <i>Acer pseudoplatanus</i> | III | + | . | . | + | + | . | + | 1 | 1 | 1 | . | + | + | + | + | + | . | . | |
| | <i>Stellaria montana</i> | III | + | 1 | 1 | 1 | + | 2 | 1 | + | 1 | + | 1 | + | 1 | + | + | 2 | 1 | . | |
| | <i>Urtica dioica</i> | III | + | + | + | . | + | + | + | + | 1 | 1 | + | 1 | 1 | + | + | 1 | 2 | 1 | |
| | <i>Adoxa moschatellina</i> | III | . | . | + | . | . | + | + | + | + | + | 1 | + | . | 1 | + | . | + | + | |
| | <i>Ulmus glabra</i> | Ia | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 |
| | <i>Ulmus glabra</i> | Ib | . | . | . | . | . | . | 2 | 1 | + | . | . | . | 2 | . | . | . | + | 1 | |
| | <i>Ulmus glabra</i> | II | . | + | . | . | . | . | 2 | 1 | + | + | 1 | + | 1 | + | + | + | + | + | |
| | <i>Ulmus glabra</i> | III | . | . | . | . | . | . | + | + | . | + | . | . | . | + | . | . | . | . | |
| | <i>Sambucus nigra</i> | Ib | . | . | . | . | . | . | + | . | + | . | + | . | + | . | . | . | . | . | |
| | <i>Sambucus nigra</i> | II | + | + | + | . | . | + | + | + | + | + | . | . | + | . | + | + | + | 1 | |
| | <i>Sambucus nigra</i> | III | r | . | . | + | . | . | . | . | . | + | . | + | . | . | + | + | . | . | |
| | <i>Doronicum austriacum</i> | III | + | 1 | + | + | + | + | . | . | . | . | . | . | + | . | . | + | + | . | |
| | <i>Geranium robertianum</i> | III | + | . | . | . | . | . | + | + | . | + | + | + | + | . | + | + | + | + | |
| | <i>Circaea lutetiana</i> | III | + | + | . | . | + | + | . | 1 | 1 | + | 1 | 2 | + | . | + | + | + | 1 | |
| | <i>Actaea spicata</i> | III | . | + | . | . | . | . | . | + | . | + | . | + | . | + | . | + | . | . | |
| | <i>Aruncus dioicus</i> | III | . | . | + | . | . | . | + | + | . | . | + | . | + | . | . | . | . | 1 | |
| | <i>Polystichum braunii</i> | III | . | 1 | . | + | . | . | 1 | + | 1 | + | + | . | . | + | . | . | + | . | |
| | <i>Lunaria rediviva</i> | III | . | . | . | . | . | . | . | 3 | 3 | 4 | + | . | . | 2 | . | . | . | 5 | |
| | <i>Polystichum aculeatum</i> | III | . | . | . | . | . | . | . | . | + | . | + | . | . | . | + | . | . | 1 | |
| | <i>Lamium orvala</i> | III | . | + | + | . | 3 | 1 | . | 3 | 2 | . | . | . | . | 1 | . | . | . | . | |
| | <i>Isopyrum thalictroides</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | . | |
| | <i>Geum urbanum</i> | III | . | . | . | . | . | . | . | . | + | . | 1 | . | . | . | . | . | . | . | |
| | <i>Circaea alpina</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| | <i>Circaea x intermedia</i> | III | . | . | . | . | + | . | . | . | . | + | . | . | . | . | . | . | . | . | |
| | <i>Polystichum x luerssenii</i> | III | . | . | . | . | . | . | . | . | . | + | . | . | . | . | . | . | . | . | |
| F | FAGETALIA SYLVATICAE | | | | | | | | | | | | | | | | | | | | |
| | <i>Petasites albus</i> | III | 3 | + | + | 1 | 1 | . | + | 2 | 2 | 3 | 3 | + | 2 | 3 | + | 1 | 3 | + | |
| | <i>Symphytum tuberosum</i> | III | . | 1 | . | + | + | + | 1 | . | . | + | . | . | + | + | . | + | + | . | |
| | <i>Dryopteris filix-mas</i> | III | . | + | + | . | + | . | . | . | . | + | . | + | 2 | . | 1 | 1 | . | + | |
| | <i>Mercurialis perennis</i> | III | . | . | . | . | . | . | . | . | . | 1 | + | . | + | 2 | . | . | + | . | |
| | <i>Asarum europaeum</i> | III | . | . | + | + | . | + | . | 1 | + | + | + | . | + | + | . | + | + | + | |
| | <i>Carex sylvatica</i> | III | + | . | + | + | + | + | . | 1 | + | + | 1 | + | + | 1 | 2 | + | + | . | |
| | <i>Fagus sylvatica</i> | Ia | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| | <i>Fagus sylvatica</i> | Ib | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |

| Relevé number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | |
|-----------------------------------|-----|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|--|
| <i>Fagus sylvatica</i> | II | . | + | + | . | . | . | . | . | . | . | . | + | . | . | + | . | . | |
| <i>Fagus sylvatica</i> | III | . | . | . | . | . | . | . | . | . | . | + | . | . | . | . | . | + | |
| <i>Galium odoratum</i> | III | . | . | . | . | . | . | + | + | + | 1 | + | 2 | . | 1 | + | + | 2 | |
| <i>Carpinus betulus</i> | Ia | + | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | |
| <i>Carpinus betulus</i> | Ib | + | + | 1 | 2 | 2 | + | + | . | + | . | 1 | 2 | . | + | 3 | . | . | |
| <i>Carpinus betulus</i> | II | . | . | . | . | 1 | . | . | . | . | . | + | . | . | + | . | . | . | |
| <i>Carpinus betulus</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| <i>Lamium flavidum</i> | III | . | . | . | . | . | . | . | . | + | . | . | + | + | . | + | + | . | |
| <i>Salvia glutinosa</i> | III | . | . | . | . | . | + | . | . | + | 2 | + | 2 | . | + | + | + | + | |
| <i>Mycelis muralis</i> | III | . | . | . | . | . | . | . | + | r | + | . | + | . | + | + | . | . | |
| <i>Corydalis solida</i> | III | . | . | . | . | . | . | + | + | r | + | . | + | + | . | . | . | . | |
| <i>Viola reichenbachiana</i> | III | . | . | . | + | . | + | . | . | r | + | + | + | + | + | + | + | + | |
| <i>Sanicula europaea</i> | III | . | . | + | . | . | . | . | + | + | + | . | + | . | + | + | . | + | |
| <i>Prenanthes purpurea</i> | III | . | . | . | . | . | . | . | . | . | + | . | . | . | . | . | . | . | |
| <i>Pulmonaria officinalis</i> | III | . | . | + | + | + | . | . | . | + | + | . | . | . | . | . | + | . | |
| <i>Epilobium montanum</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + | + | . | |
| <i>Lamium montanum</i> | III | 1 | + | + | + | 1 | 1 | 1 | . | . | . | . | . | . | . | . | . | . | |
| <i>Scrophularia nodosa</i> | III | . | . | . | r | . | . | . | . | . | . | . | . | . | . | . | . | + | |
| <i>Daphne mezereum</i> | II | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| <i>Daphne mezereum</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| <i>Poa nemoralis</i> | III | . | . | . | . | . | . | . | . | r | . | . | + | . | . | . | . | + | |
| <i>Phyteuma spicatum</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| <i>Milium effusum</i> | III | . | . | . | . | . | . | . | . | + | . | . | + | . | . | . | 1 | . | |
| <i>Heracleum sphondylium</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | |
| <i>Corydalis cava</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | . | |
| <i>Ranunculus lanuginosus</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | + | + | |
| <i>Campanula trachelium</i> | III | . | . | . | . | . | . | . | . | . | . | 1 | + | . | 2 | . | . | . | |
| <i>Polygonatum multiflorum</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| <i>Lilium martagon</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| QF QUERCO-FAGETEA | | | | | | | | | | | | | | | | | | | |
| <i>Anemone nemorosa</i> | III | . | + | 1 | + | . | + | + | + | r | + | . | . | 1 | . | + | + | . | |
| <i>Corylus avellana</i> | Ib | . | . | . | . | . | . | . | . | + | . | + | 1 | . | . | . | 2 | . | |
| <i>Corylus avellana</i> | II | . | 1 | 1 | + | . | . | + | . | + | + | 1 | + | + | + | . | . | . | |
| <i>Corylus avellana</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| <i>Castanea sativa</i> | Ia | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| <i>Castanea sativa</i> | Ib | . | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | |
| <i>Castanea sativa</i> | II | . | . | . | . | + | . | + | . | . | . | . | . | . | . | . | . | . | |
| <i>Castanea sativa</i> | III | . | . | . | . | . | . | . | . | . | . | + | r | . | + | + | . | . | |
| <i>Moehringia trinervia</i> | III | . | . | . | . | + | . | . | . | + | . | 1 | . | . | + | . | . | + | |
| <i>Hedera helix</i> | III | r | . | . | . | . | . | . | . | . | + | + | . | . | + | . | . | . | |
| <i>Carex digitata</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | . | |
| <i>Campanula persicifolia</i> | III | . | . | . | . | . | . | . | . | . | + | . | . | . | + | . | . | + | |
| <i>Clematis vitalba</i> | III | + | . | . | . | . | . | . | . | . | . | + | . | . | . | . | . | . | |
| <i>Lathraea squamaria</i> | III | . | . | . | . | . | . | . | . | . | . | r | . | r | . | . | . | . | |
| <i>Cruciata glabra</i> | III | . | . | . | . | . | . | . | . | . | . | + | . | . | + | . | . | . | |
| <i>Cardaminopsis halleri</i> | III | . | . | . | . | . | . | . | . | . | . | 2 | . | . | . | + | . | . | |
| <i>Ranunculus ficaria</i> | III | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | . | . | |
| <i>Digitalis grandiflora</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | |
| <i>Veronica officinalis</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + | |
| <i>Quercus petraea</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| AF AREMONIO-FAGION s. lat. | | | | | | | | | | | | | | | | | | | |
| <i>Cardamine trifolia</i> | III | 1 | 2 | 1 | 1 | . | 1 | 1 | + | . | + | + | . | . | 2 | . | . | . | |
| <i>Knautia drymeia</i> | III | . | . | . | . | . | . | . | + | . | . | . | . | . | + | + | . | . | |
| <i>Euphorbia carniolica</i> | III | . | . | + | + | . | . | + | . | . | . | . | . | . | . | . | . | . | |

| Relevé number | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|-------------------------------------|-----|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|
| <i>Cyclamen purpurascens</i> | III | . | . | . | + | . | . | . | . | . | . | . | + | . | . | . | . | . | . |
| <i>Dentaria enneaphyllos</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| AU ALNO-ULMION | | | | | | | | | | | | | | | | | | | |
| <i>Impatiens noli-tangere</i> | III | . | + | + | + | + | + | . | 1 | . | 3 | 3 | + | + | + | . | 1 | 2 | 2 |
| <i>Chrysosplenium alternifolium</i> | III | + | . | + | + | . | + | . | + | + | 1 | 1 | . | . | . | . | + | 1 | + |
| <i>Deschampsia cespitosa</i> | III | . | . | . | . | . | + | . | . | + | + | . | + | . | . | 1 | 1 | . | . |
| <i>Carex brizoides</i> | III | 2 | + | . | + | + | + | . | . | . | 1 | . | . | . | + | . | . | + | . |
| <i>Chaerophyllum hirsutum</i> | III | . | . | . | . | . | + | . | + | . | + | . | . | . | 1 | . | + | . | . |
| <i>Stachys sylvatica</i> | III | . | . | . | . | . | . | . | . | . | . | . | + | + | . | . | . | + | . |
| <i>Alnus incana</i> | Ia | . | . | . | . | . | . | . | . | . | 1 | . | . | . | + | . | . | . | . |
| <i>Alnus incana</i> | Ib | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | + | 1 | + |
| <i>Alnus incana</i> | II | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + |
| <i>Festuca gigantea</i> | III | . | . | . | . | . | + | . | + | + | . | . | . | . | . | . | r | . | . |
| <i>Dryopteris carthusiana</i> | III | . | + | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Angelica sylvestris</i> | III | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | . | . | . |
| <i>Stellaria nemorum</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Matteuccia struthiopteris</i> | III | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | + |
| <i>Thalictrum aquilegifolium</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | . |
| VP VACCINIO-PICEETEA | | | | | | | | | | | | | | | | | | | |
| <i>Oxalis acetosella</i> | III | + | + | 1 | 1 | 1 | 1 | 1 | + | + | 1 | 2 | . | + | 1 | . | + | 2 | . |
| <i>Picea abies</i> | Ia | . | + | . | . | 1 | . | . | + | . | . | + | + | + | . | . | . | . | . |
| <i>Picea abies</i> | Ib | . | . | . | . | + | . | . | . | . | . | . | . | 2 | + | . | 1 | . | . |
| <i>Picea abies</i> | II | + | . | + | . | . | . | . | + | . | + | + | + | + | . | + | + | . | + |
| <i>Picea abies</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Gentiana asclepiadea</i> | III | . | . | + | . | . | . | . | + | + | + | + | . | + | + | . | . | + | + |
| <i>Luzula pilosa</i> | III | + | + | . | + | . | . | . | . | . | . | + | . | . | . | . | . | . | . |
| <i>Hieracium sylvaticum</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + |
| <i>Veronica urticifolia</i> | III | . | . | . | . | . | . | . | . | + | . | . | . | . | . | . | . | . | . |
| <i>Solidago virgaurea</i> | III | . | . | . | . | . | . | . | . | . | . | . | + | . | . | 1 | . | . | . |
| <i>Huperzia selago</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Luzula sylvatica</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| A ADENOSTYLETALIA | | | | | | | | | | | | | | | | | | | |
| <i>Athyrium filix-femina</i> | III | 2 | 1 | + | 2 | 2 | 2 | 2 | + | 1 | 1 | 1 | 2 | . | + | + | 1 | + | + |
| <i>Senecio fuchsii</i> | III | . | . | + | + | + | + | + | . | . | . | + | . | + | + | . | + | . | + |
| <i>Myosotis sylvatica</i> | III | . | . | + | . | . | + | . | + | + | . | + | . | . | + | . | . | . | + |
| <i>Anthriscus nitidus</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | + | . | . | . |
| <i>Senecio nemorensis</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + | . |
| <i>Silene dioica</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + |
| <i>Veratrum album</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| ASPLENIETEA | | | | | | | | | | | | | | | | | | | |
| AT TRICHOMANIS | | | | | | | | | | | | | | | | | | | |
| <i>Cystopteris fragilis</i> | III | . | . | . | . | . | . | . | + | + | + | + | . | . | + | + | . | + | . |
| <i>Polystichum x illyricum</i> | III | . | . | . | . | . | . | . | . | . | . | . | + | . | . | + | . | + | + |
| <i>Polypodium vulgare</i> | III | . | + | . | + | . | . | . | . | . | . | . | . | . | + | . | . | . | . |
| <i>Asplenium trichomanes</i> | III | . | . | . | . | . | . | . | . | + | . | . | . | . | + | + | . | . | + |
| <i>Asplenium viride</i> | III | . | . | . | . | . | . | . | + | + | . | + | . | . | . | . | . | . | . |
| <i>Cardaminopsis arenosa</i> | III | . | . | . | + | . | + | . | . | . | . | . | . | . | . | + | . | . | . |
| O OTHER SPECIES | | | | | | | | | | | | | | | | | | | |
| <i>Rubus fruticosus agg.</i> | II | . | + | + | + | 1 | + | + | + | + | . | . | + | . | 3 | . | + | 2 | + |
| <i>Rubus fruticosus agg.</i> | III | + | . | . | . | . | . | . | 1 | 2 | + | 1 | 1 | + | 1 | + | . | . | 1 |
| <i>Galeopsis speciosa</i> | III | . | . | + | + | . | . | . | . | . | r | 1 | . | . | . | + | + | + | + |

| Relevé number | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|-----------------------------|-----|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|
| <i>Cardamine flexuosa</i> | III | . | . | . | . | . | + | . | . | . | + | + | . | . | . | + | + | + | . |
| <i>Sorbus aucuparia</i> | Ia | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Sorbus aucuparia</i> | Ib | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Sorbus aucuparia</i> | II | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Sorbus aucuparia</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Hypericum hirsutum</i> | III | . | . | . | . | . | . | . | + | + | r | + | . | . | . | . | . | . | . |
| <i>Rubus idaeus</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Salix caprea</i> | Ib | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Ajuga reptans</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . |
| <i>Alliaria petiolata</i> | III | . | . | . | . | . | . | . | . | . | . | . | + | . | . | + | . | . | . |
| <i>Chaerophyllum aureum</i> | III | . | . | + | . | . | . | . | . | . | . | . | . | . | . | . | . | . | + |
| <i>Sambucus racemosa</i> | II | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Sambucus racemosa</i> | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |

M MOSSES

| | | | | | | | | | | | | | | | | | | | |
|-----------------------------------|----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| <i>Plagiomnium undulatum</i> | IV | + | + | + | + | . | . | . | + | + | 1 | + | . | . | 4 | . | . | 1 | . |
| <i>Plagiothecium nemorale</i> | IV | + | . | . | + | + | . | + | . | + | . | 2 | . | . | . | . | . | . | . |
| <i>Brachythecium rutabulum</i> | IV | + | . | . | + | . | . | . | + | + | + | . | . | . | + | . | . | 1 | . |
| <i>Hypnum cupressiforme</i> | IV | . | . | + | . | . | . | + | . | . | 1 | + | . | + | . | . | . | + | . |
| <i>Eurhynchium angustirete</i> | IV | + | . | . | . | . | . | + | 1 | + | + | + | . | . | . | . | . | + | . |
| <i>Ctenidium molluscum</i> | IV | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | + | . |
| <i>Plagiochila asplenioides</i> | IV | . | + | + | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Atrichum undulatum</i> | IV | . | 1 | + | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . |
| <i>Brachythecium populeum</i> | IV | . | . | . | . | . | . | + | . | + | . | . | . | 1 | . | . | + | + | . |
| <i>Plagiomnium affine</i> | IV | . | . | . | . | . | . | . | . | + | 1 | . | . | . | + | . | . | + | . |
| <i>Isotechyum alopecuroides</i> | IV | . | + | . | . | . | . | + | . | . | + | . | . | + | . | . | . | . | . |
| <i>Plagiothecium denticulatum</i> | IV | . | . | + | + | . | . | + | . | . | . | . | . | . | . | . | . | . | . |
| <i>Polytrichum formosum</i> | IV | . | . | . | + | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Eurhynchium praelongum</i> | IV | . | . | . | . | . | . | . | + | . | . | . | . | . | . | . | . | . | . |
| <i>Schistidium apocarpum</i> | IV | . | . | . | . | . | . | . | . | . | . | . | . | + | . | . | . | + | . |
| <i>Thuidium tamariscinum</i> | IV | . | . | + | . | . | . | + | . | . | . | . | . | . | + | . | . | . | . |
| <i>Herzogiella seligeri</i> | IV | . | . | . | . | + | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Dicranum scoparium</i> | IV | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Rhizomnium punctatum</i> | IV | + | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Marchantia polymorpha</i> | IV | . | . | + | + | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Bryum species</i> | IV | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Plagiomnium cuspidatum</i> | IV | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Hylocomium splendens</i> | IV | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Brachythecium plumosum</i> | IV | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |

Table 6: Synoptic table of Illyrian maple forests and comparison to Central-european maple forests on the silicate bedrock
Tabela 6: Sinoptična tabela ilirskih javorjevih gozdov in primerjava s srednjeevropskimi javorjevimi gozdovi na silikatni matični podlagi

| | | | | | | | | | | | | | | |
|--------------------|----|----|---|---|----|----|----|----|---|----|----|----|----|----|
| Number of syntaxon | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| Number of relevés | 22 | 51 | 7 | 5 | 15 | 15 | 18 | 18 | 9 | 7 | 25 | 37 | 7 | 6 |

| | |
|------------------------|----------------------|
| <i>Fraxino-Acerion</i> | <i>Tilio-Acerion</i> |
|------------------------|----------------------|

DIFFERENTIAL SPECIES OF ASSOCIATION *Dryopterido affini-Aceretum*

| | | | | | | | | | | | | | | |
|--------------------------------|-----|----|---|--|----|----|----|----|----|----|----|-----------|-----------|-------|
| <i>Dryopteris affinis</i> | III | 9 | | | | 7 | 20 | 28 | 22 | | 29 | 81 | 100 | |
| <i>Dryopteris dilatata</i> | III | 18 | 6 | | | | | 6 | | | 29 | 8 | 51 | 71 67 |
| <i>Luzula luzuloides</i> | III | | | | 20 | 7 | 7 | 6 | | | | | 46 | 43 33 |
| <i>Phegopteris connectilis</i> | III | 14 | | | | 13 | 7 | 6 | 6 | 11 | | 4 | 43 | 33 |
| <i>Gymnocarpium dryopteris</i> | III | 9 | | | | | 7 | | | | | | 30 | 33 |

CHARACTER SPECIES OF ALLIANCE *Fraxino-Acerion*

| | | | | | | | | | | | | | | |
|---------------------------------------------|-----|----|----|-----|-----|-----|----|----|----|----|-----|----|-----------|----|
| <i>Lamium orvala</i> | III | 32 | 75 | 86 | 80 | 100 | 93 | 78 | 50 | 56 | 100 | 72 | 22 | |
| <i>Stellaria montana</i> | III | 73 | 47 | 100 | | 13 | 53 | 39 | 50 | 33 | | 40 | 92 | |
| <i>Doronicum austriacum</i> | III | 32 | 22 | 100 | 60 | 7 | 7 | 33 | 11 | | | 52 | 57 | |
| <i>Polystichum setiferum et xbicknellii</i> | III | 14 | 61 | | | | 33 | 17 | | 11 | | | 35 | |
| <i>Isopyrum thalictroides</i> | III | | 53 | 71 | | 100 | 60 | 39 | | | | | 14 | |
| <i>Scopolia carniolica</i> | III | 45 | 53 | 43 | | | | 17 | | | | | 19 | |
| <i>Polystichum braunii et xluerssenii</i> | III | 50 | | | | | 47 | | 22 | | | | 43 | 57 |
| <i>Tanacetum macrophyllum</i> | III | | | | 100 | | | | | | | | | |

REGIONAL CHARACTER SPECIES OF ALLIANCE *Fraxino-Acerion* (differential species towards *Aremonio-Fagion*)

| | | | | | | | | | | | | | | | |
|----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|----|-----|-----|-----|-----------|-----|-----|
| <i>Acer pseudoplatanus</i> | I | 100 | 100 | 86 | 80 | 80 | 67 | 94 | 94 | 78 | 100 | 100 | 95 | 57 | 100 |
| <i>Acer pseudoplatanus</i> | II | 36 | 53 | 71 | 40 | 67 | 53 | 61 | 83 | 67 | 43 | 32 | 35 | 14 | 83 |
| <i>Acer pseudoplatanus</i> | III | 77 | 75 | 29 | 40 | 47 | 73 | 78 | 6 | | 57 | 76 | 73 | 14 | |
| <i>Actaea spicata</i> | III | 73 | 49 | 14 | 100 | 27 | 60 | 56 | 89 | 56 | 86 | 80 | 51 | 14 | 33 |
| <i>Fraxinus excelsior</i> | I | 5 | 14 | 100 | 100 | 100 | 100 | 100 | 94 | 100 | 100 | 4 | 43 | 29 | 17 |
| <i>Fraxinus excelsior</i> | II | | 10 | 86 | 40 | 60 | 73 | 61 | 83 | 100 | 57 | 4 | 32 | | |
| <i>Fraxinus excelsior</i> | III | 5 | 4 | 29 | 100 | 33 | | 78 | 39 | | 14 | | 30 | 14 | |
| <i>Sambucus nigra</i> | I | | 2 | 14 | | | | | | | | | 11 | 14 | |
| <i>Sambucus nigra</i> | II | 86 | 96 | 100 | 100 | 7 | 47 | 78 | 67 | 89 | 71 | 12 | 54 | 14 | |
| <i>Sambucus nigra</i> | III | | 2 | | | | | | | | | | 30 | 57 | |
| <i>Urtica dioica</i> | III | 82 | 92 | 100 | 100 | 20 | 53 | 39 | 56 | 44 | 86 | 100 | 78 | | 67 |
| <i>Lunaria rediviva</i> | III | 14 | 75 | 100 | 100 | 13 | 47 | 22 | 17 | 11 | 100 | 36 | 32 | | 67 |
| <i>Ulmus glabra</i> | I | 41 | 53 | 57 | 40 | | 13 | 50 | 56 | 22 | | 12 | 38 | 71 | 50 |
| <i>Ulmus glabra</i> | II | 45 | 49 | 29 | 60 | 20 | 60 | 61 | | 22 | | 12 | 57 | 29 | 50 |
| <i>Ulmus glabra</i> | III | 9 | 2 | | 40 | | | 6 | | | | 12 | 27 | 29 | |
| <i>Circaea lutetiana</i> | III | 50 | 61 | 57 | 100 | 7 | 47 | 22 | 39 | 11 | | 12 | 51 | | 17 |
| <i>Geranium robertianum agg.</i> | III | 73 | 51 | 14 | 100 | | 27 | 11 | 72 | 67 | 100 | 80 | 54 | | 100 |
| <i>Aruncus dioicus</i> | III | | 8 | 43 | 20 | 20 | 20 | 67 | 50 | 22 | 29 | 4 | 46 | 57 | |
| <i>Arum maculatum</i> | III | 86 | 88 | 100 | 40 | 67 | 80 | 72 | 33 | 22 | | 8 | | | 33 |
| <i>Phyllitis scolopendrium</i> | III | 68 | 63 | 29 | | | 40 | 28 | 61 | 44 | 71 | 36 | 3 | | 17 |
| <i>Polystichum aculeatum</i> | III | 50 | 16 | | | | 20 | 39 | 39 | 11 | 57 | 64 | 32 | 100 | 50 |
| <i>Adoxa moschatellina</i> | III | 73 | 71 | 100 | | 73 | 73 | 39 | 33 | | 71 | 96 | 76 | | |
| <i>Tilia platyphyllos</i> | I | 27 | 8 | | | | | | 22 | 11 | | | 3 | | |

| Number of syntaxon | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|--------------------------------|-----|----|----|----|-----|----|----|----|----|----|----|----|----|----|----|
| Number of relevés | | 22 | 51 | 7 | 5 | 15 | 15 | 18 | 18 | 9 | 7 | 25 | 37 | 7 | 6 |
| <i>Tilia platyphyllos</i> | II | 5 | 8 | | | 13 | | 22 | | 11 | | | | | 33 |
| <i>Tilia platyphyllos</i> | III | 5 | | | | | 13 | 6 | | | | | | | |
| <i>Glechoma hederacea</i> agg. | III | | 51 | 86 | 100 | 27 | 13 | 28 | 22 | 44 | | | 14 | | |
| <i>Geum urbanum</i> | III | | | 57 | 100 | 47 | 33 | 6 | 39 | 22 | | 12 | 11 | | |
| <i>Acer platanoides</i> | I | | 29 | | 40 | | 13 | 11 | 6 | | | | | | |
| <i>Acer platanoides</i> | II | | 16 | 14 | 40 | 40 | 27 | 28 | | | | | | | |
| <i>Acer platanoides</i> | III | | 4 | | 20 | | 27 | 6 | | | | | | | |
| <i>Euonymus latifolia</i> | II | | 12 | | | | 20 | 6 | 17 | | | | | | |
| <i>Euonymus latifolia</i> | III | | | 14 | | | | | | 22 | | | | | |
| <i>Circaea x intermedia</i> | III | 9 | 4 | | | | | | 6 | | 57 | | 5 | | |
| <i>Hesperis matronalis</i> | III | | 4 | 43 | | | 7 | | | | | | | | |
| <i>Tilia cordata</i> | I | | | | | | | | 50 | 11 | | | | | |
| <i>Tilia cordata</i> | II | | | | | | 7 | | 44 | | | | | | |
| <i>Tilia cordata</i> | III | | | | | | | | 6 | | | | | | |
| <i>Ribes alpinum</i> | II | | | | | | | 6 | | | | 8 | | | |
| <i>Ribes alpinum</i> | III | | | | | | | | | | | | | | 33 |
| <i>Circaea alpina</i> | III | | | | | | | | | | | 20 | 8 | | 50 |
| <i>Staphylea pinnata</i> | II | 23 | | | | | | 11 | | | | | | | |
| <i>Asperula taurina</i> | III | | | | | | | | 33 | 11 | | | | | |
| <i>Ribes uva-crispa</i> | II | 5 | | | | | | | | | | | | | |
| <i>Botrychium virginianum</i> | III | | | | | 20 | | | | | | | | | |

AREMONIO-FAGION and ERYTHRONIO-CARPINION species (differential species towards *Tilio Acerion*)

| | | | | | | | | | | | | | | |
|-------------------------------|-----|----|----|----|-----|-----|----|----|----|----|----|----|----|----|
| <i>Cardamine trifolia</i> | III | 73 | 4 | 29 | 100 | 87 | 40 | 50 | 17 | 44 | 29 | 68 | 51 | 14 |
| <i>Dentaria enneaphyllos</i> | III | 86 | 65 | 57 | 100 | 47 | 53 | 28 | 11 | | 86 | 92 | 5 | 57 |
| <i>Cyclamen purpurascens</i> | III | | 16 | 14 | 40 | 53 | 40 | 50 | 22 | 22 | 43 | | 8 | |
| <i>Aposeris foetida</i> | III | | | 71 | 60 | 100 | 80 | 83 | 6 | 33 | 29 | | | |
| <i>Vicia oroboides</i> | III | 9 | 8 | 71 | 60 | 13 | 27 | 28 | | | | | | |
| <i>Aremonia agrimonoides</i> | III | 23 | 4 | | 40 | 33 | 7 | | 6 | | | 28 | | |
| <i>Primula vulgaris</i> | III | | | | 60 | 47 | 7 | 11 | 44 | 56 | | | | |
| <i>Omphalodes verna</i> | III | 86 | | | | | 20 | 39 | 17 | | | 4 | | |
| <i>Dentaria trifolia</i> | III | | 53 | 43 | | 73 | 53 | | | | | | 57 | |
| <i>Hacquetia epipactis</i> | III | | 8 | | 20 | 73 | 67 | 72 | | | | | | |
| <i>Helleborus odoratus</i> | III | | 8 | | | | 33 | 50 | 56 | 22 | | | | |
| <i>Knautia drymeia</i> | III | | | 57 | 20 | | | 11 | 11 | | | | 14 | |
| <i>Euphorbia carniolica</i> | III | | | 57 | | | 20 | 50 | | | | 4 | 8 | |
| <i>Helleborus niger</i> | III | | | | | 53 | 7 | 17 | 6 | | 29 | | | |
| <i>Dentaria polyphylla</i> | III | 5 | 78 | 57 | 80 | | | | | | | | | |
| <i>Lonicera caprifolium</i> | II | | | | | | 7 | 39 | 11 | | | | | |
| <i>Lonicera caprifolium</i> | III | | | | | | | | | 11 | | | | |
| <i>Geranium nodosum</i> | III | 64 | | | | | | | 11 | | | 8 | | |
| <i>Crocus napolitanus</i> | III | | | | | 100 | 53 | 78 | | | | | | |
| <i>Anemone trifolia</i> | III | | | | | | | 50 | 28 | 67 | | | | |
| <i>Calamintha grandiflora</i> | III | 32 | | | | | | | | | | 28 | | |
| <i>Ruscus hypoglossum</i> | III | | 4 | | | | | 6 | | | | | | |
| <i>Erythronium dens-canis</i> | III | | | | 40 | | | | | 11 | | | | |
| <i>Rhamnus fallax</i> | II | | | | | | | | | | 43 | 4 | | |
| <i>Eranthis hyemalis</i> | III | | 8 | | | | | | | | | | | |
| <i>Helleborus atrorubens</i> | III | | 4 | | | | | | | | | | | |
| <i>Epimedium alpinum</i> | III | | | | | | | | | 33 | | | | |